

APPENDICES

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OVEN MOUNTAIN PUMPED HYDRO
ENERGY STORAGE EIS

Aboriginal cultural heritage assessment report



OVEN MOUNTAIN
PUMPED HYDRO STORAGE



Aboriginal Cultural Heritage Assessment

Oven Mountain Pumped Hydro Energy Storage

OMPS Pty Ltd

J210465 OMPS EIS - ACHA

March 2023

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Content warning

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Executive Summary

OMPS Pty Ltd (OMPS) is proposing to develop the Oven Mountain Pumped Hydro Energy Storage Project (the Project), an off river pumped hydro energy storage system (referred to as the 'pumped hydro system') located approximately half-way between Kempsey and Armidale adjacent to the Macleay River in northern NSW. At a basic level, the Project will consist of upper and lower water reservoirs, an underground tunnel connecting them, and a hydro-electric power station connected to the national electricity market (NEM) that is capable of generating or consuming electricity.

The Project has been declared by the New South Wales (NSW) Government to be critical State significant infrastructure (CSSI) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Infrastructure projects are declared to be CSSI if, in the opinion of the NSW Minister for Planning, they are essential to the State for economic, environmental, or social reasons. As CSSI, the project is subject to Division 5.2 of the EP&A Act, which requires the preparation of an environmental impact statement (EIS) and the approval of the NSW Minister for Planning and Public Spaces. This Aboriginal cultural heritage assessment (ACHA) has been prepared to support the EIS.

The ACHA was conducted to present the findings of the Aboriginal community consultation, previous investigations regarding Aboriginal cultural and archaeological heritage values, and physical investigation and ground-truthing of the Project. It provides information on the location, distribution and significance of Aboriginal objects identified within the Project area and environs; and the potential impacts to objects by the proposed development; and recommendations for the management of such impacts.

The ACHA adopted the processes and methods outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), as well as more extensive engagement activities. The latter included face-to-face and/or digital meetings, project updates, engagement of an Aboriginal liaison officer, and numerous on-site activities. Overall, the Project has been liaising with 19 registered Aboriginal party (RAP) organisations since its inception in September 2021. Following the initial identification of 52 Aboriginal stakeholder organisations who may have had an interest in the project, some 14 registered an interest in the early stages of the project (September and October 2021). A further five organisations registered an interest during the project between February and June 2022. The project has registered any Aboriginal organisation and/or individual throughout the project regardless of when they have become known or identified their interest. Opportunity for Aboriginal involvement in the project was provided throughout the ACHA, including:

1. attendance at 15 meetings held with organisations and/or a large number of RAPs both face-to-face in the local region, and online
2. participation in a five week field survey of the construction envelope
3. participation in a four week archaeological test excavation of the construction envelope
4. collection and relocation of cultural materials at risk of harm during the EIS investigative process
5. participation for key knowledge-holders to visit the site with a highly experienced anthropologist to discuss cultural values.

Ultimately, over 100 interactions have been undertaken with the RAPs across these opportunities. Some six of the RAP organisations – identified in discussions between the proponent and Thunggutti Local Aboriginal Land Council (LALC) – participated in these opportunities, totalling over 280 days on site cumulatively, and included Thunggutti LALC, Three Ducks Dreaming, Iwatta Aboriginal Corporation, Bruce Cohen, Gumaraa Aboriginal Experience Pty Limited and QMS.

An extensive program of ground-truthing was undertaken as part of this assessment, including cultural mapping, archaeological field survey and test excavations to explore and document the Aboriginal objects, site and places within the Project area, and to align them within the regional context. Overall, the findings were found to largely conform with the regional models, although an increasing focus on intangible and cultural values was undertaken to supplement the observed archaeological record. When combining and ratifying the findings of these various activities, there are some 44 identified sites and places across the Project area and surrounds, along with a continuous and complex distribution of surface and shallowly buried stone artefacts distributed across the construction envelope. These can be broken down as:

- Four cultural, historical and/or social history sites identified in the vicinity of the Project area, including:
 - Kunderang Station (OMPS-CS3), a large pastoral station to the west of the Project area with a history of frontier conflict and associated with the pastoral history interlinked with work lives of local Aboriginal families; George's Creek Camp (OMPS-CS4) and Lower Creek/Long Flat Station (OMPS-CS5), both post contact camp sites and the reported locations of initiation ceremonies; and, AHIMS# 21-5-0023, a catfish increase site believed to be a large rock in a portion of rapids within the Macleay River.
- Forty archaeological sites including:
 - 24 culturally modified trees (OMPS-ST1 – 24), 6 stone arrangements (OMPS-SA1 – 6), 5 artefact scatters with ≥ 24 artefacts identified (AHIMS #21-5-0142, OMPS-AS1, 26, 33 and 36), 2 quarry sites (OMPS-Q1 and 2), 2 rockshelters (OMPS-R1 and 2), and one grinding groove site (OMPS-GG1). Many of these sites were assigned a tentative classification given a lack of archaeological characteristics; and all are recommended for further specialist investigation.
 - A stone artefact background scatter is predicted to occur across the entire construction envelope and extending beyond its limits within which low artefact densities of $\sim 16/\text{m}^2$ may be expected (OMPS-BS1), and which includes identified isolated Aboriginal objects (OMPS-IF1 – 32 inclusive) and low-density artefact scatters (OMPS-AS2–25, 27–32, 34–35, and 37–42 inclusive). These sites are typically of low significance and reflect the long-term, transient use of the entire landscape by Aboriginal people in the past.
 - Fifteen areas of past foci and activity (OMPS-FA1 – 15 inclusive) characterised by high densities of primarily sub-surface artefacts ranging from $\sim 24 \rightarrow 236/\text{m}^2$ ($\bar{x} = 81/\text{m}^2$) with at least one test pit (T7P1, now OMPS-FA7) having values of $> 8,000/\text{m}^2$ and which reflect extensive and/or repeated visitation and occupation by people over the last 5 ka. Several of the field observations are also encompassed within these site's curtilage, where stone artefacts were identified on the surface near these locations during the test excavation program. These foci are generally small and averaging ~ 0.6 ha (80 x 80 m) in size, although several of them overlap to form larger areas.

The Project would consist of the establishment of new, off-river upper and lower water storage dams and reservoirs, transmission connection works, and ancillary activities; and includes tunnels, pumping stations, spillways, substations, access roads and tracks, quarries and temporary accommodation. The Project would result in a disturbance footprint of around 330 ha. A larger construction envelope (around 780 ha) is being considered as part of the EIS to allow some movement and flexibility in the Project's final design. However, any Project designs within the construction envelope would be required to avoid Aboriginal sites and places considered of moderate or high significance.

Of the 44 discrete Aboriginal sites and places, sites within, or near the disturbance footprint, 19 would be potentially adversely affected. This includes 12 that would be subject to direct impacts resulting in their complete or partial loss; three would be inundated by the eventual reservoirs created; and three of the cultural places have the potential to be indirectly affected through view-line and/or hydrological changes, which require further exploration in subsequent stages of the Project. At least one of these, Kunderang Station, has been subject to broader visual impact considerations as part of the EIS, and shown to have minimal impacts, but has not been specifically discussed with the local Aboriginal community. Some 25 of the sites would be unaffected, including several of moderate and high significance. In addition, the Project would directly impact some 5.74 ha (51%) of identified areas of high artefact densities, but OMPS-FA7, the site that contained the most significant cultural materials, would be unaffected. A significant axe production site, #21-5-0042 would also be unaffected.

A low-density stone artefact background scatter is considered present across the entire disturbance footprint and would be adversely affected. The highly significant Carrai waterholes, situated some ~3.2 km south of the Project area would be unaffected based on surface and groundwater modelling; and is not visible to/from the Project area.

Recommendations are proposed for inclusion in the EIS to guide post-approval management requirements for Aboriginal heritage. These include (further discussion is presented in Section 11.2):

- Prior to the granting of any Project approval, the archaeological test excavation proposed in Section 7.3 of the ACHA must be completed. Due to unprecedented weather conditions, the program could not be completed prior to the completion of this report. While it is not considered that the findings of these additional works would result in fundamental changes to the findings or recommendations of the ACHA, they nonetheless are required to inform the final designs of the eastern access road (EAR).
- Prior to construction ground disturbance, an Aboriginal Cultural Heritage Management Plan (ACHMP) must be developed by a heritage specialist in consultation with the Registered Aboriginal Parties (RAPs) and consent authority to provide the post-approval framework for managing Aboriginal heritage within the Project area. The ACHMP should include the following issues:
 - Processes, timing, communication methods and Project involvement (e.g. on-site activities) for maintaining Aboriginal community consultation and participation through the remainder of the project. This should include a grievance mechanism that is readily available and designed for use by the local Aboriginal community.
 - If not previously completed, discuss and identify any areas of design optimisation with the RAPs to avoid or further minimise harm to identified Aboriginal sites, objects and place.
 - If not previously completed and where necessary, provide descriptions and methods for undertaking further investigation and assessment of the sites currently assigned a tentative classification (OMPS-ST1-24 inclusive, OMPS-SA1-6 inclusive, OMPS-Q2, OMPS-R1 and R2, OMPS-GG1) to gain a comprehensive understanding of these sites for subsequent management through construction of the Project.
 - If not previously completed, provide descriptions and methods for undertaking on-Country meetings with the Elders and key knowledge-holders to discuss any potential view-line impacts of the Project and places of cultural value (OMPS-CS3-CS5 inclusive, etc.), and their subsequent management.

- Detail descriptions and methods of any additional investigative and/or mitigative archaeological actions that may be required prior to construction works commencing or during the Project. These should include, but not limited to, archival recording of all identified Aboriginal objects, sites and places; suitable recovery or relocation, documentation and analysis of any archaeological sites proposed for direct impacts (OMPS-ST2, OMPS-ST9, OMPS-ST10, OMPS-ST19, OMPS-ST21, OMPS-ST22, OMPS-SA1, OMPS-SA3, OMPS-SA6, OMPS-AS33, OMPS-Q1, OMPS-BS1); management of any archaeological excavation of areas of significant buried cultural material (OMPS-FA1-15 inclusive) and where direct impacts are proposed; and/or cultural monitoring for any areas identified by Aboriginal community as having significant cultural value. Further details of these activities are presented in Section 11.2. For these activities, details of location/s, methods, personnel, and timing should be included.
- Description and methods of actions to minimise any inadvertent impacts to identified Aboriginal objects and/or sites and areas of archaeological sensitivity outside of the disturbance footprint. This should include, but not be limited to, cultural inductions for all personnel and subcontractors outlining their location and significance, fencing and clear marking of heritage sites and zones of interest in close proximity to proposed works, appropriate screening for sensitive and gender-specific areas, and any additional requirements identified by the Aboriginal community. A suitable regime of monitoring these activities should also be outlined, including locations, methods, personnel and timing.
- Description and methods for undertaking further Aboriginal heritage assessment, investigation and mitigation of any areas of the disturbance footprint that have changed following completion of the ACHA and/or during the final design and construction phases of the project.
- Description and methods of post-excavation analysis and reporting of the archaeological investigations and activities implemented as part of the ACHMP. For excavations, these should include suitable collection and processing of stone artefacts, and chronological, soil, and environmental samples.
- Procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human remains during the Project.
- Procedures for the curation and long-term management of cultural materials recovered or relocated as part of the works outlined in the ACHMP and any preceding stages associated with the Project.
- Processes for reviewing, monitoring, and updating the ACHMP as the project progresses.
- A heritage-interpretation strategy must be developed by a heritage specialist to identify the interpretive values of the Project area, and specifically Aboriginal heritage values across the construction envelope, and to provide direction for potential interpretive opportunities for the Project. This strategy should be made available for consultation and feedback with the RAPs. Following consultation and feedback on the strategy, a heritage interpretation plan would refine the strategy with content (visual and textual) and design details in order to allow the implementation stage. The interpretation strategy and interpretation plan must include consideration of three main components identified through the ACHA process:
 - Input and feedback from the RAPs, which to date include a number of cultural, historical and social history places from both traditional and contemporary connection of the Project area with the Aboriginal community; and a range of flora and fauna that have totemic, medicinal and/or economic association with the Aboriginal community.

- The historical record of the study and its immediate environs, which has documented associations with Aboriginal people, dating to the post-Contact period.
- The past cultural and environmental landscape informed by current archaeological investigations and analysis of the ACHA, and any future activities that may result from the Project (e.g. archaeological salvage of key locales).
- Water for the initial filling of the reservoirs and for top ups is proposed to be taken from the Macleay River through a Specific Purpose Access Licence (SPAL) under the NSW *Water Management Act 2000*. The SPAL will contain conditions which limit the overall volume of water that can be taken from the river, and it is expected that it will contain conditions which limit times and volumes that water can be extracted based on flows in the river. Consideration of cultural flows of the Macleay River and Georges Creek – and with a focus on the increase site, #21-5-0023 – should be given when developing the application for the SPAL. This should include a compilation of cultural and environmental information about these river systems, consideration of the specific cultural values and places affected by water flows, and consideration of the requirement of water flows to maintain their cultural integrity. This might include the following:
 - A background description of the Aboriginal sites, objects, places and values, and their significance; and information on how water influences their significance and integrity. This may require additional investigations if there are impacts identified to Aboriginal sites, objects, places and values that are not addressed in the ACHA.
 - An overview of the catchment or river systems, including hydrological information from prior to establishment of the dams and reservoirs.
 - Clear objectives for the cultural flow in maintaining the significance of the Aboriginal sites, objects, places and values.
 - Description of how water will be managed into the future to maintain necessary water regimes; and any constraints/limitations.
- The Construction Environment Management Plan (CEMP), or equivalent, should reinforce how the cultural landscape is considered throughout the Project and detail the rehabilitation of the disturbance footprint. Rehabilitation of areas where infrastructure is not remaining after construction of the Project should be undertaken to determine suitable ecological communities and other factors in returning the cultural landscape as close to its current state as feasible.
- Consultation should be maintained with the RAPs during the finalisation of the assessment process and throughout the Project.
- A copy of the ACHA should be lodged with AHIMS and provided to each of the RAPs.
- AHIMS Site Recording Forms for the newly identified Aboriginal objects and/or sites within the Project area and areas of archaeological sensitivity should be submitted to the AHIMS database once their validation has been completed.
- Where the heritage consultant changes through the Project, suitable hand over should be undertaken to minimise loss or mistranslation of the intent of the information, findings and recommendations.

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1 Introduction

1.1 The Project

OMPS Pty Ltd (OMPS) is proposing to develop the Oven Mountain Pumped Hydro Energy Storage Project (the Project), an off-river pumped hydro energy storage system (referred to as the ‘pumped hydro system’) located approximately half-way between Kempsey and Armidale, adjacent to the Macleay River in northern NSW. The Project is located within the New England Renewable Energy Zone (REZ) and the Armidale Regional Local Government Area (LGA), proximate to its border with Kempsey Shire LGA.

Figure 1.1 and Figure 1.2 provide the regional and local context of the Project respectively.

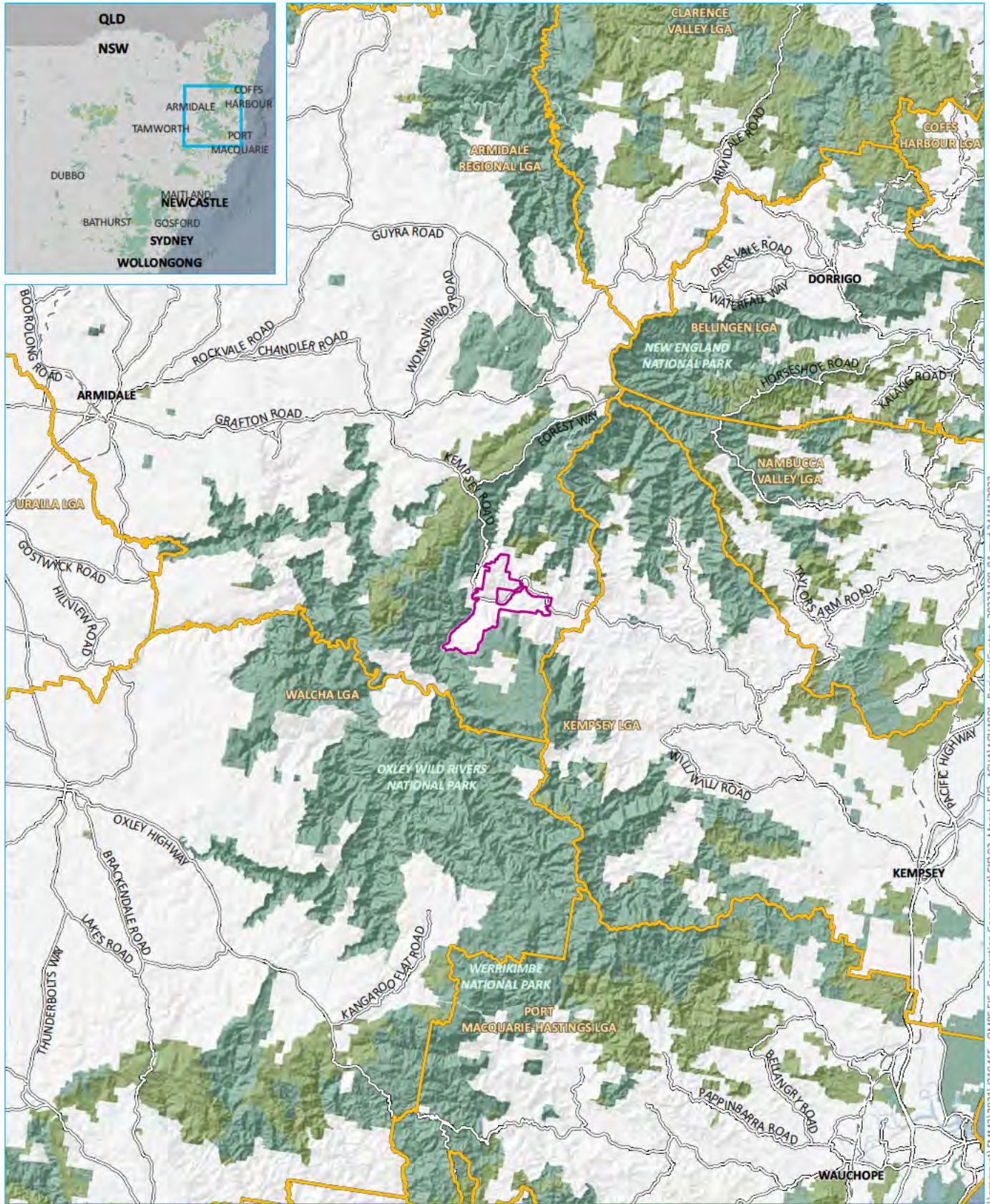
At a basic level, the Project will consist of upper and lower water reservoirs and an underground waterway connecting them via a hydro-electric power station.

The Project has been declared by the New South Wales (NSW) Government to be critical State significant infrastructure (CSSI) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Infrastructure projects are declared to be CSSI if, in the opinion of the NSW Minister for Planning, they are essential to the State for economic, environmental, or social reasons. By providing up to 900 MW of electricity generating capacity, the Project will aid in the transition of the NEM towards cleaner, more reliable and affordable electricity. It will also provide up to between eight and 12 hours of dispatchable energy at full generation to be stored and made available to the National Electricity Market (NEM) through the New England REZ. The expected operational lifespan of the Project is in excess of 100 years.

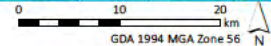
The Project will utilise the highly favourable natural terrain of the site on which it sits to allow electrical energy from the main grid to be stored by pumping water from the lower reservoir to the upper reservoir. Energy can then be generated when needed by allowing water to flow back down to the lower dam and reservoir via the hydro-electric power station, effectively enabling the Project to act as a large battery.

1.2 Proponent

OMPS (ABN 22 160 259 174) is developing the Project and is located in Kempsey at 2/28 Clyde Street, Kempsey NSW 2440.



Source: EMM (2022); ABS (2021); DFSI (2020, 2021); GA (2011)



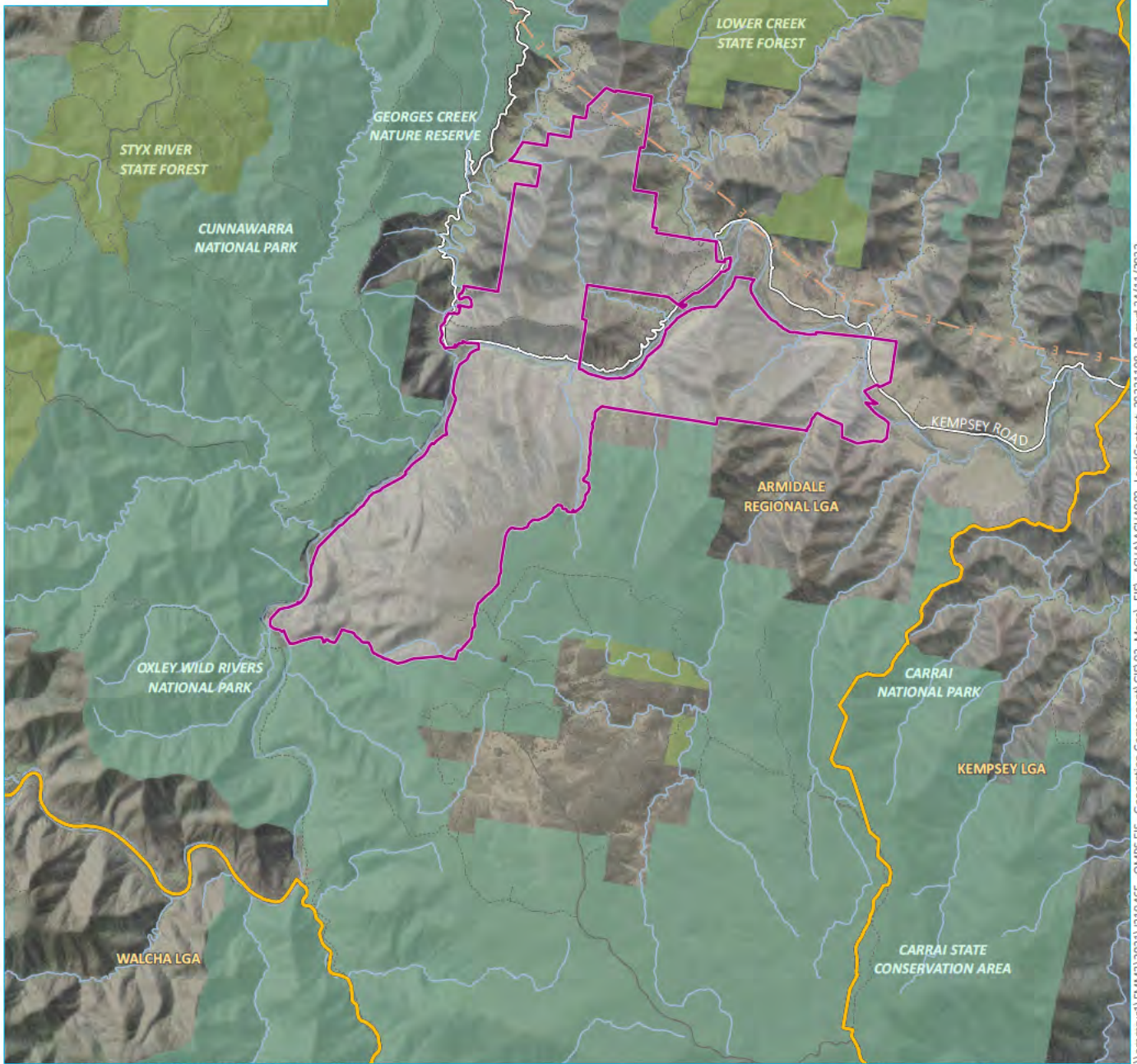
- KEY**
- Project area
 - Rail line
 - Major road
 - Named waterbody
 - Local government area
 - NPWS reserve
 - State forest
- INSET KEY**
- Major road
 - NPWS reserve
 - State forest

Regional setting

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 1.1



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Source: EMM (2022); ABS (2021); DFSI (2020, 2021); GA (2011, 2020)

KEY

- | | | |
|----------------------------|-----------------------|------------------|
| Project area | Local government area | INSET KEY |
| Existing transmission line | NPWS reserve | Major road |
| Major road | State forest | NPWS reserve |
| Minor road | | State forest |
| Vehicular track | | |
| Named watercourse | | |
| Named waterbody | | |

Project footprint

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 1.2



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1.3 Purpose and scope of this report

This Aboriginal cultural heritage assessment (ACHA) is an attachment to the Project's environmental impact statement (EIS) and should be read in conjunction with it. It documents the results of archaeological and anthropological investigations undertaken to identify the extent and significance of any physical remains and intangible values of past Aboriginal visitation, use and occupation within the Project area. The objectives of the investigation were to:

- Consult with and involve key Aboriginal community members and knowledge holders to identify areas and places of cultural value within or in the vicinity of the Project area.
- Compile a review of existing environmental, historical and archaeological information for the Project area, by identifying and summarising known and previously recorded Aboriginal heritage places, cultural values areas and landforms of archaeological interest in its immediate surrounds.
- Determine if any Aboriginal objects, places, cultural values areas, or areas of archaeological potential are present (or are likely to be present) within the Project area (with a focus on the construction envelope), as well as areas of existing disturbance, through ground-truthing, including field survey and test excavations.
- Identify the type, nature, and extent of any Aboriginal sites, objects, archaeological deposits, potential archaeological deposits, and cultural values areas within or near the Project area.
- Map the locations of known and potential Aboriginal sites, objects and deposits and cultural values areas identified.
- Assess the archaeological and cultural significance of the Project area.
- Assess and identify heritage constraints and opportunities and the potential impacts of the Project.
- Identify and recommend measures to mitigate any heritage impacts and risks to the Project.

1.4 Legislative context

There are several Commonwealth and state Acts (and associated regulations) that manage and protect Aboriginal cultural heritage (Appendix A). These are summarised in Table 1.1.

Table 1.1 Commonwealth and State legislation relevant to the Project

Legislation	Description	Relevant to the project?	Details
Commonwealth			
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Recognises sites with universal value on the World Heritage List (WHL). Protects Indigenous heritage places with outstanding heritage value to the nation on the National Heritage List (NHL), and significant heritage value on the Commonwealth Heritage List (CHL).	No	There are no Indigenous heritage places within the Project area that are listed on the WHL, NHL, or the CHL.
<i>Native Title Act 1993</i>	Administers rights and interests over lands and waters by Aboriginal people. Provides for negotiation and registration of Indigenous Land Use Agreements (ILUAs). Often used in NSW to identify relevant stakeholders for consultation.	No	There are no native title applications or determinations that encompass the Project area.
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Preserves and protects areas and objects of particular significance to Aboriginal people that are under threat from injury or desecration.	No	There are no areas or objects within the Project area subject to a Declaration under the Act.
State			
<i>Environmental Planning and Assessment Act 1979</i>	Requires environmental impacts, including to Aboriginal heritage, to be considered in land use planning. Provides for the development of environmental planning instruments, including State Environmental Planning Policies and Local Environmental Plans.	Yes	The proposed development is being assessed as a CSSI project under Part 5, Division 5.2, of this Act, and is subject to project-specific environmental assessment and reporting requirements. These requirements (SEARs) stipulate that Aboriginal heritage impact assessment is required (in accordance with standard Heritage NSW procedures and guidelines) to assess whether the Project has the potential to impact on Aboriginal objects, sites, or places of Aboriginal heritage significance.
<i>National Parks and Wildlife Act 1974</i>	Provides blanket protection for all Aboriginal objects and declared Aboriginal places. Includes processes and mechanisms for development where Aboriginal objects are present, or where Aboriginal Places are proposed for harm.	Yes	While elements of this Act do not apply to CSSI projects, the potential impact on Aboriginal objects generally still requires consideration as a part of the assessment needs of such projects. Further regulations of this Act outline the adoption of guidelines, which have been adopted in the case of Aboriginal consultation (Chapter 3), research (Chapters 4–6), and on-site activities (Chapter 7).

Table 1.1 Commonwealth and State legislation relevant to the Project

Legislation	Description	Relevant to the project?	Details
<i>Aboriginal Land Rights Act 1983</i>	Establishes Local Aboriginal Land Councils (LALCs). Allows transfer of ownership of vacant crown land to a Local Aboriginal Land Council. The Office of the Registrar, <i>Aboriginal Land Rights Act 1983 (ORALRA)</i> , registers Aboriginal land claims and maintains the Register of Aboriginal Owners. Often used in NSW to identify relevant stakeholders for consultation.	No	A request to search the Register of Aboriginal Owners was made to the ORALRA on 6 August 2019. The Project area does not appear to have Registered Aboriginal Owners pursuant to Division 3 of the Act. The relevant Local Aboriginal Land Council (LALC) has been consulted extensively on the Project.

1.5 Assessment guidelines and requirements

This ACHA has been prepared to address the Secretary’s Environmental Assessment Requirements (SEARs) issued by DPIE (now the NSW Department of Planning and Environment (DPE)) on 10 June 2022 (SSI-12422997). This assessment also considers relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

Table 1.2 lists the matters relevant to this assessment and where they are addressed in this report.

Table 1.2 Relevant matters raised in SEARs

Requirement	Section addressed
Assess the impact to Aboriginal cultural heritage items (archaeological and cultural) in accordance with <i>the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW</i> (OEH, 2011) and the <i>Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW, 2010),	Entire report, including a review of existing environmental, archaeological and ethnographic materials (Chapter 4–6), on-site investigations to identify cultural materials (Chapter 7), development of an archaeological model (Chapter 8), determination of significance of the cultural materials identified (Chapter 9), determination of potential impacts (Chapter 10), and management of cultural materials (Chapter 11).
Provide evidence of consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures), having regard to <i>the Aboriginal Cultural Heritage Consultation Requirements for Proponents</i> (DECCW, 2010);	Chapter 3, Appendix B

1.6 Other relevant reports

This report makes reference to other technical studies undertaken for the EIS, and the results of which inform the potential impacts and management of the cultural landscape. These include:

- EMM (2022a) Oven Mountain Pumped Hydro Storage Project – Statement of Heritage Impact
- EMM (2022b) Oven Mountain Pumped Hydro Storage Project – Surface Water Assessment
- EMM (2022c) Oven Mountain Pumped Hydro Storage Project – Groundwater Impact Assessment
- EMM (2022d) Oven Mountain Pumped Hydro Storage Project – Lands, Soils and Erosion Assessment
- EMM (2022e) Oven Mountain Pumped Hydro Storage Project – Landscape and Visual Impact Assessment.

1.7 Limitations

This report is based on existing and publicly available environmental and archaeological information (including AHIMS data) and reports about the Project area. The background research did not include any independent verification of the results and interpretations of externally sourced existing reports (except where the ground-truthing was undertaken). The report further makes archaeological predictions based on these existing data and targeted ground-truthing, and which may contain errors depending on the accuracy of these third party studies and the extent of ground-truthing (constrained to surface) investigations.

As is outlined in Section 7.3.1, the archaeological test excavations were implemented during extremely poor weather conditions, and the proposed program could not be completed within the Project's required timeframes. While some ~75% of the program was completed, a component at the eastern portion of the EAR was not investigated. It is considered that any findings in this locale would not fundamentally alter the overall findings presented in this report. Further, OMPS have committed to undertaking these remaining archaeological excavations at the earliest opportunity in 2023 when weather conditions and access have improved.

This report does not consider historical and/or built heritage unless specifically related to Aboriginal heritage values. Such heritage items are addressed in the Statement of Heritage Impact (SOHI) appended to the EIS.

2 The Project description

2.1 Project overview

The Project involves building two 'off river' water containment structures to create an upper and a lower reservoir (referred to as 'the upper dam and reservoir' and 'the lower dam and reservoir'), on an ephemeral tributary of the Macleay River. An underground hydro-electric power station complex will be connected to the reservoirs by infrastructure including a power waterway and tunnels. During operation, the water will enable the generation of electricity as it passes through the underground power station while moving from the upper to the lower reservoir, from where it is pumped back up via the same waterway in a 'closed-loop circuit'. The pumped hydro system will be connected to the existing transmission network via new overhead high voltage transmission lines.

A detailed description of the Project and its strategic context is provided in the Project's EIS which should be read in conjunction with this report.

An overview of the key components and elements are provided below.

2.2 Key Project design elements

Broadly, the Project has been categorised into three key components, which are further broken down into the Project's key elements in Table 2.1 and shown in Figure 2.1:

- pumped hydro-electric and generation works (PHGW) – including:
 - new upper and lower water storage dams and reservoirs
 - a new underground pumped hydro-electric power station and transformer hall
 - water tunnels, access tunnels, portals and adits
 - tailrace
 - intake and outlet structures
 - associated gates, shafts and screens
- transmission connection works – including:
 - new electricity transmission lines to connect the PHGW to the existing electricity transmission network (Line 965)
 - new electricity transmission infrastructure
 - a new substation
- ancillary development – including but not limited to:
 - access roads, tracks and bridge
 - on-site quarries and related infrastructure
 - utilities and communications infrastructure
 - construction pads containing assets such as workshops, concrete batching plants (CBPs), and offices

- laydown and storage areas
- construction accommodation
- pumping infrastructure
- operational facilities such as offices, and camps for staff
- construction and operational power supply.

Table 2.1 Key Project elements

Project element	Description
PHGW	
Underground power station complex	<p>An underground pumped hydro-electric power station located below the upstream end of the pumped hydro system to optimise the hydraulic arrangement of the Project. The power station complex consists of:</p> <ul style="list-style-type: none"> • two main caverns comprising; <ul style="list-style-type: none"> – the machine hall – the transformer hall • interconnecting tunnels, the transformer hall tunnel and isolated phase busbar (IPB) tunnels.
Dams and reservoirs	<p>Two concrete faced rockfill dams (CFRD) and reservoirs, referred to as the upper dam and reservoir and lower dam and reservoir, with the following specifications:</p> <hr/> <p>Upper dam and reservoir:</p> <ul style="list-style-type: none"> • CFRD approximately 70 metres (m) high and 780 m long • reservoir covering a total area of approximately 20 hectares (ha) and an inundation extent of approximately 16.7 ha • reservoir height of 881 m Australian Height Datum (AHD) at full supply level (FSL) and 830 m AHD at minimum operating level (MOL) • total reservoir storage capacity of around 5.1 gigalitres (GL) at FSL. <hr/> <p>Lower dam and reservoir:</p> <ul style="list-style-type: none"> • CFRD approximately 70 m high and 280 m long • reservoir covering a total area of approximately 24.7 ha and an inundation extent of approximately 21.6 ha • reservoir height of 250 m AHD at FSL, 215 m at MOL and 205 m AHD at lowest operating level (LOL) • total reservoir storage capacity of around 6.5 GL at FSL.
Water intake structures	<p>Two intake structures, one at each reservoir, including:</p> <ul style="list-style-type: none"> • a morning glory, vertical-type intake structure situated at the upper dam and reservoir • a lateral intake structure, with head gates and stoplog slots, and an intake channel, at the lower dam and reservoir.
Spillway	<p>Two concrete lined spillway chutes, one for each of the upper and lower dams and reservoirs. Both spillway crests will comprise of ungated ogee-shaped overflow weirs on the upstream ends of the spillway chutes.</p>
Macleay River pump facility	<p>A pump facility on the Macleay River, which will include duty and standby pumps for the first fill and for ongoing reservoir refills.</p>

Table 2.1 Key Project elements

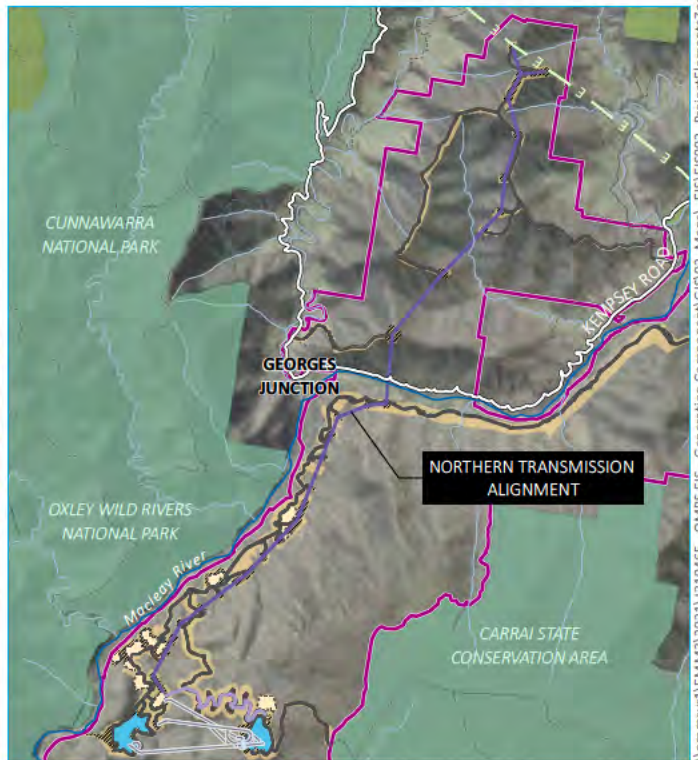
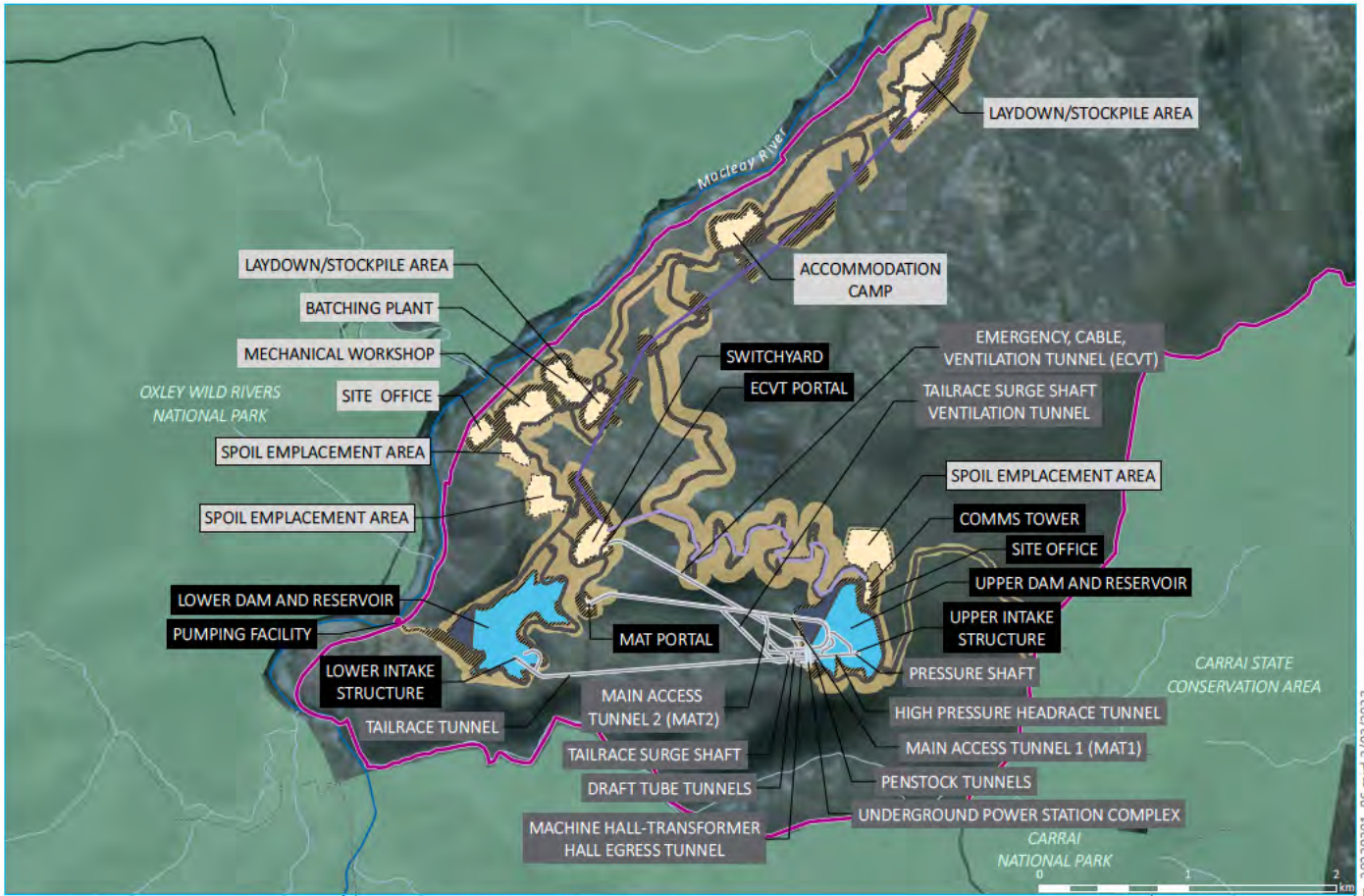
Project element	Description
Tunnels	<p>Three main tunnels comprising of:</p> <ul style="list-style-type: none"> • two main access tunnels (MAT1 and MAT2) • the emergency, cable, ventilation tunnel (ECVT). <p>The MAT1 and MAT2 will provide loop access to the power station complex from the MAT portal. The ECVT will provide services access and egress between the switchyard portal and the transformer hall. The ECVT portal will contain the station switchyard, control rooms, ventilation and firefighting equipment, with blast walls separating important equipment.</p>
Power waterway	<p>The power waterway will consist of:</p> <ul style="list-style-type: none"> • a 660 m deep, 5.1 m diameter vertical pressure shaft • 250 m concrete and steel lined high-pressure headrace tunnel • three or more 80 m long penstock tunnels • three or more 120 m long draft tube tunnels • an approximately 1,825 m long concrete lined tailrace tunnel.
Transmission connection works	
Connection works	<p>The connection works will consist of:</p> <ul style="list-style-type: none"> • an approximately 15km long transmission alignment comprising, at a maximum, double circuit single tower 330 kV overhead infrastructure and single circuit single tower 132 kV overhead infrastructure connecting to TransGrid Line 965 • up to 25 transmission tower sites (approximately 50 m x 50 m) containing the 132 kV and 330 kV infrastructure • a transmission easement width of a maximum of approximately 105 m. <p>Note: The upgrade of existing Line 965 will be the subject of a separate application.</p>
Sub-station	Construction of a substation and associated connection infrastructure of up to 330 kV rating.
Switchyard	<p>A high voltage connection linking the connection transmission lines to the cables exiting the underground power station complex. The outdoor air insulated switchyard will likely include:</p> <ul style="list-style-type: none"> • switchgear and control room • cable potheads • disconnectors/earth switches • capacitive voltage transformer (VT) • lightning protection • security fencing, lighting and surveillance • surge arrester.
Ancillary development (construction and operation)	
Access roads, access tracks and bridge	<p>A variety of road works to improve existing access, and construction of new permanent roads to enable construction access, temporary establishment and use of construction sites, and general access to the Project area including transmission line infrastructure.</p> <p>The proposed main access will be via the construction of a new unsealed two-lane access road located to the east of the site. The main access road will interface with the existing Kempsey-Armidale Road and will require the construction of one new single or two lane low-level bridge crossing over the Macleay River. A temporary bridge may be utilised prior to the construction of the permanent bridge.</p>

Table 2.1 Key Project elements

Project element	Description
	<p>There will be approximately 40 km of permanent roads connecting the dams, surface works, portals, transmission assets and spoil sites. Some of these roads are existing roads, however approximately 25 km will be newly constructed roads. The key road components include:</p> <ul style="list-style-type: none"> • Main Access Road (approximately 4.7 km) • Eastern Access Road (up to approximately 11.4 km) • Lower Dam Access Road (approximately 3.6 km) • Upper Dam Access Road (approximately 7.1 km) • access to portals and underground works • Upper Dam Emergency Egress Road (approximately 2.2 km). <p>Access to the transmission infrastructure north of the Macleay River will be via two roads accessed from the Kempsey-Armidale Road. These two roads include the:</p> <ul style="list-style-type: none"> • Northern Transmission Access Road (approximately 15 km) • Southern Transmission Access Road (approximately 2.3 km). <p>To support access along the transmission line easement south of the Macleay River and to each of the tower sites, a network of interconnecting access and maintenance tracks will be constructed, to a large extent utilising existing access tracks.</p>
Surface works pads and facilities	<p>There are four main construction pads in addition to surface portals which will be used temporarily during construction for different services (workers camp, construction site offices, workshop area, and laydown storage).</p> <p>Construction works will require the establishment of the following ancillary support infrastructure and areas:</p> <ul style="list-style-type: none"> • main accommodation camp(s), which will temporarily accommodate the majority of workers as required workers as required throughout the construction period • temporary or fly camps, which will temporarily accommodate the majority of workers as required throughout the construction period • two works areas including Works Area 1 and Works Area 2, which will contain ancillary facilities such as CBPs, mechanical and electrical workshops, a laboratory and various water treatment and wash areas • spoil emplacement areas • staging area • stockpiling areas • temporary site offices to be used during construction.
Communications	<p>Communication infrastructure such as fibre optic cables are required for the operation of the Project and will be located:</p> <ul style="list-style-type: none"> • on an overhead line linking the upper and lower dams and reservoirs (in conjunction with the electrical line) • buried in road corridors. <p>The communication network will also include a communications tower near the upper dam and reservoir.</p>
Utilities during construction	<ul style="list-style-type: none"> • Construction water will be supplied either via groundwater bores, or via pumping of water from the Macleay River to support camp operations, the CBP, dust suppressions and other activities across the site. • Construction power will be supplied primarily by use of portable diesel generators and supported where possible by leveraging off existing electricity distribution infrastructure running through the generation site.
Utilities for operation	<p>Alignment and length of utilities (electricity, water, etc.) will be combined into a single corridor (total length of about 5.4 km).</p>

Table 2.1 Key Project elements

Project element	Description
Water diversion and water treatment facilities	<ul style="list-style-type: none"> • Site drainage will include a combination of cross drainage culverts, drainage pits and pipe, open channels/open drains (vegetated, rock-lined or concrete), levees/bunds, and detention basins. • Various water treatment plants will be used for construction drainage and water treatment facilities – for the main accommodation camp, temporary or fly camps, CBP, tunnel, etc. • Specific discharge locations are planned for stormwater and surface water runoff.
Laydown/stockpile areas	Temporary laydown/stockpile areas will be utilised across the Project area, with a total allocated stockpile area of around 114,000 m ² .
Spoil emplacement areas	To accommodate spoil generated through excavation of the underground caverns and tunnels, three permanent spoil placement locations have been identified with a capacity to store around 2 million cubic metres (Mm ³) of material. Dead storage space within the reservoirs will also be used for spoil placement, with a capacity to store approximately 300,000–400,000 m ³ .
Ancillary operational facilities	Primary operation of the Project can be undertaken remotely and will require minimal onsite operational staff, other than for maintenance activities. Operational facilities include maintenance housing, work area, car parking, workshop and storage, control room and switchgear, water treatment plant, office area, heating, ventilation and air conditioning (HVAC), backup generators and Macleay River pump facility.
Other	
Construction	<ul style="list-style-type: none"> • Construction duration of around four to five years. • Construction workforce of over 600 to approximately 1,000 workers at construction peak.
Rehabilitation	<p>Rehabilitation of areas disturbed during pre-construction and construction will be undertaken progressively during all stages and phases of the Project. Progressive rehabilitation will occur over about 60 ha including spoil emplacement areas and areas used for construction ancillary facilities no longer needed during operation.</p> <p>At the end of the Project’s life, 192 ha in total will be rehabilitated to native ecosystem (including native vegetation and rock landscape). Approximately 138 ha will be retained permanently for the water storages and access roads, subject to agreement with relevant landowners/land managers.</p>
Operation	<ul style="list-style-type: none"> • The Project will provide up to 900 MW of electricity generating capacity and up to eight hours of energy storage at full generating capacity. • Maintenance and operational activities will include power station operations, infrastructure inspections, maintenance to assets, vegetation management, auditing and compliance and other activities. • It is expected that the operation of the new power station will require around 30-50 full-time workers, as well as additional contractors for regular and ad hoc maintenance and repairs.
Hours of operation	<ul style="list-style-type: none"> • Construction of the Project will be 24/7 and 365 days per year. • Operation of the Project will be 24/7 and 365 days per year.
Project timeline	The Project will involve the construction and operational stages, and numerous phases which are outlined in the Project’s EIS.
CIV	Estimated to be about \$1.8 billion.



Source: EMM (2022); DFSI (2020); GA (2011); SMEC (2022)

KEY

- Project area
- Disturbance footprint
- Construction envelope
- Surface works
- Project operational elements**
- Underground power station complex
- Power and communications lines
- Transmission overhead lines
- Tunnels, portals, intakes, shafts
- Permanent road
- Reservoir
- Dam wall
- Existing environment**
- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Vehicular track
- Existing transmission line
- NPWS reserve
- Label format**
- SURFACE PERMANENT INFRASTRUCTURE
- UNDERGROUND PERMANENT INFRASTRUCTURE
- TEMPORARY INFRASTRUCTURE
- PERMANENT SPOIL EMPLACEMENT

Key Project Elements

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 2.1



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2.3 Project area terminology

Approval for the Project is being sought based on feasibility and concept designs as is common for projects of this size and scale. To accommodate minor changes and amendments to the design as it progresses, a 'Project area', 'construction envelope', 'disturbance footprint' and 'operational footprint' approach is being adopted for the Project. This approach is aimed at ensuring environmental impacts are assessed as accurately as possible, whilst accounting for the current level of design and the likelihood of design refinements occurring as the Project progresses towards construction. The terms are explained below.

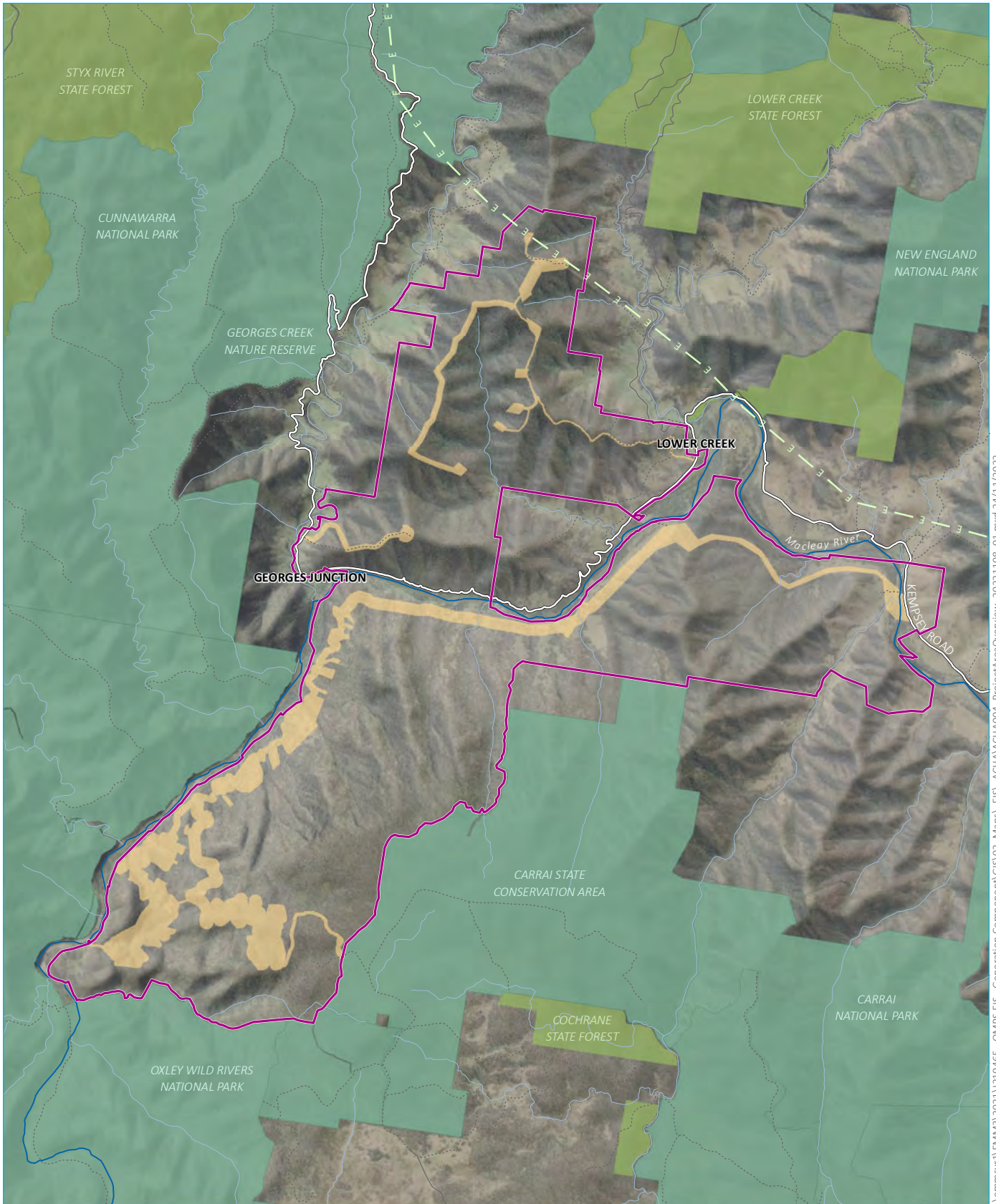
The *Project area* is the broader area within which the Project will be built and operated, and the extent within which direct impacts from the Project are anticipated. Importantly the Project area does not represent a footprint for the construction works, but rather indicates an area that was investigated during environmental assessments. The Project area has been further divided into different areas to facilitate the assessment of direct impacts from the Project.

The *construction envelope* represents the maximum extent of where disturbance may occur during the construction of the Project. In order to derive the construction envelope, buffers have been applied to the key Project elements and infrastructure. The buffers used to derive the final construction envelope area reflect the confidence around the current siting of the asset or infrastructure, and the likelihood that some amendments may be required prior to commencing the construction works as a result of the detailed design. The construction envelope for the Project covers an area of around 780 ha.

Located entirely within the bounds of the construction envelope sits the *disturbance footprint*, a smaller area that has been derived directly from the current level of design. The disturbance footprint represents the physical disturbance that can be expected as part of the construction works. As the design is refined, the final siting of the disturbance footprint can move within the construction envelope, subject to the recommended environmental management measures, and provided it does not exceed any limits as defined by the construction envelope. It is proposed that part of the disturbance footprint will be rehabilitated, and land formed at the completion of the Project. However, other parts will be retained after construction which is necessary for the ongoing operation and maintenance of the new power station (*operational footprint*). The disturbance footprint for the Project covers an area of around 330 ha.

Progressively and at the end of construction, temporary components that are required to support the construction of the Project will be rehabilitated and returned to a state representing their previous use. The exceptions to this are the areas required for the permanent operation of the Project, which would be retained (referred to as the *operational footprint*). The operational footprint of the Project covers an area of around 270 ha. Approximately 60 ha would be progressively rehabilitated during and following the completion of construction.

The Project area, construction envelope and disturbance footprint are shown in Figure 2.2.



Source: EMM (2022); DFSI (2020); GA (2011); SMEC (2022)

KEY

- | | | |
|-----------------------|----------------------------|--------------|
| Project area | Existing environment | NPWS reserve |
| Construction envelope | Macleay River | State forest |
| | Watercourse/drainage line | |
| | Kempsey-Armidale Road | |
| | Minor road | |
| | Vehicular track | |
| | Existing transmission line | |

Project areas overview

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 2.2



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3 Aboriginal consultation

3.1 Key findings

- The Project assessment adopted the processes and methods outlined in DECCW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), as well as additional Project-specific communication strategies to promote transparent and frequent two way dialogue between the Aboriginal community and the Project. These latter activities included Aboriginal focus group meetings (face-to-face and online) throughout the assessment process, other meetings as requested by the local Aboriginal community, a cultural values mapping investigation with Elders and key-knowledge-holders, and the engagement of an Aboriginal liaison officer through the majority of the on-site activities (March – September 2022).
- Consultation with Heritage NSW has conformed with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), and included provision of information on registered Aboriginal parties (RAPs), and notification of the various field survey and excavation activities associated with the Project. Various informal discussions with Heritage NSW were also undertaken and included the management and relocation of cultural materials in some parts of the construction envelope, investigative methods, and more recently in discussions of the content and finalisation of the report.
- Overall, the Project has been liaising with 19 RAPs organisations and/or individuals since its inception in early September 2021. These have been identified through the formal notification as part of the Heritage NSW consultation requirements and/or through contacting the Project following word of mouth within the local Aboriginal community. The RAPs include a large number of individuals and/or organisations based in Bellbrook, Armidale and/or surrounds, as well as a smaller proportion that are based in Sydney, Gunnedah, and Wollongong, but have ancestral connections to the region. Following the initial identification of 52 Aboriginal stakeholder organisations who may have had an interest in the Project, some 14 registered an interest in the early stages of the Project (September and October 2021). A further five organisations registered an interest during the Project between February and June 2022. The Project has registered any Aboriginal organisation and/or individual throughout the Project regardless of when they have become known or identified their interest.
- Opportunity for Aboriginal involvement in consultation for the Project was provided throughout the ACHA, including:
 1. attendance at 15 meetings held with organisations and/or a large number of RAPs both face-to-face in the local region, and online;
 2. participation in a five week field survey of the construction envelope
 3. participation in a four week archaeological test excavation of the construction envelope
 4. collection and relocation of cultural materials at risk of harm during the EIS investigative process
 5. participation for key knowledge-holders to undertake interviews with a highly experienced anthropologist to discuss cultural values.

Ultimately, over 100 interactions have been undertaken with the RAPs across these opportunities. Some six of the RAP organisations – identified in discussions between OMPS and Thunggutti LALC¹ – participated in these opportunities, totalling over 280 days on site cumulatively, and included Thunggutti LALC, Three Ducks Dreaming, Iwatta Aboriginal Corporation, Bruce Cohen, Gumaraa Aboriginal Experience Pty Limited and QMS.

Discussions with the RAPs have been extensive and wide-ranging over the 16-month assessment process. Feedback on the Project and ACHA activities has been mixed. Specific inputs varied as the Project progressed, but included extensive discussion on who speaks for Country, who should participate in the on-site activities and how often, understanding the assessment process, and identifying concerns over broader environmental issues (notably the impacts to cultural flows of Macleay River). Later discussions focussed on key sites, including the axe quarry that has been avoided near Georges Junction, and a number of artefact scatters identified as part of the field activities. These are all acknowledged in this report in Section 3.4, Appendix B.5, and/or proposed for management following Project approval.

3.2 The process

Two parallel and overlapping consultation processes were undertaken as part of the ACHA. As a requirement of the SEARs, consultation was undertaken in accordance with Heritage NSW guidelines (Section 3.2.1). In addition, due to the size, complexity and fluidity of the Project, numerous other communication strategies were employed to improve and maintain dialogue with the local Aboriginal community (Section 3.2.2).

3.2.1 Heritage NSW guidelines

Aboriginal consultation for this Project has been undertaken in accordance with procedures set out in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010), which themselves are outlined in the National Parks and Wildlife Regulations. These guidelines identify a five-stage process:

1. Pre-notification – identification of the Aboriginal individuals and/or communities relevant to the Project area by contacting several state government agencies.
2. Notification – contacting all Aboriginal individuals and/or communities identified in Stage 1 to determine their interest in being consulted during the Project. This includes direct communication and the placement of advertisements in local media seeking further expressions of interest from Aboriginal individuals and/or communities that may have been missed through Stage 1. Those Aboriginal individuals and/or communities that wish to be consulted become a ‘registered’ Aboriginal party (RAP).
3. Presentation of project information/assessment methodology – briefing RAPs about the Project and scope of any Aboriginal heritage assessment and investigations. This is usually undertaken through written correspondence, but can include meetings, and may undergo several iterations through the Project as the nature of the assessment changes (e.g. surface ground-truthing may lead to a requirement for test excavations).
4. Impacts and mitigation strategies – discussion of potential impacts to cultural materials and mitigation options with the RAPs prior to developing the ACHA. This is often undertaken either onsite at the end of any field program and/or as part of Stage 5.
5. Report review – the RAPs are provided an opportunity to review and comment upon the draft ACHA, to contribute input into the overall findings, significance and management of cultural heritage.

¹ Note that this report has adopted reference to the ‘Thunggutti’ people to align with the name and information provided by the LALC. It is recognised that research also identifies accepted indications such as Thungutti, Dunghutti, Dhanggati and others.

The consultation process for the Project had two aims:

1. To comply with the Heritage NSW consultation procedures to obtain input on the ACHA process.
2. To identify cultural places and intangible values that may be affected by the Project.

3.2.2 Other communication strategies

In addition to the required steps outlined in Section 3.2.1, OMPS and EMM implemented a range of other strategies to promote transparent and frequent two-way dialogue between the Aboriginal community and the Project.

Specifically, the strategy included the following additional activities:

- Face-to-face meetings – Aboriginal focus group (AFG) meetings were held to promote two-way dialogue, allow project flexibility and to maintain regular interaction with the RAPs. These were held during the initial stages of the Project, and during report finalisation, at a location within the Project area and/or nearby venue, with options for online and/or phone meetings as required.
- Meetings requested by the RAPs – all requests to undertake one-on-one or small group meetings by the RAPs were undertaken. These were typically undertaken on-line and primarily in relation to on-site activities.
- Regular catch ups and a local base of operations – OMPS established an information hub in Kempsey to allow drop-ins and regular attendance within the local community. This included regular meetings with the Thungutti LALC, as well as other Aboriginal community representatives throughout the ACHA process.
- Aboriginal community liaison officer and advisor engagement – the Project employed an Aboriginal representative from the local community (Lenny Wright) to provide a local conduit for the transfer of cultural information to assist in the ACHA process. Since December 2022, the Project has also engaged a First Nations Engagement manager.
- Field investigation participation – all RAPs were offered the opportunity to attend a range of field survey and test excavations activities carried out across the construction envelope. Initially all RAPs were asked to contact the Thungutti LALC to discuss their relationship with the Project area, and then OMPS/EMM were advised of those to be included in fieldwork. Ultimately, over 280 person days of participation in the Project were undertaken by the RAPs.
- Cultural values mapping – a dedicated investigation of intangible and cultural places, stories and values by an experienced anthropologist in consultation with 15 Elders and/or knowledge-holders across the Kempsey and Bellbrook region. This enabled a broader range of the local Aboriginal community that would otherwise have been unable to provide input (given the rugged environment of the project area) to the Project.

3.3 This Project

3.3.1 Liaising with Heritage NSW

As part of the ACHA, various interactions with Heritage NSW have been undertaken:

- Provision of information of the registered Aboriginal stakeholders involved in the Project following the notification process (Table 3.1) – 12 November 2020 (Appendix B.1 and B.3).
- Informal consultation – numerous discussions were undertaken with Nicole Davis (Manager Assessments) and Rose O’Sullivan (Regional Archaeologist) during the Project. These focussed primarily on the need to recover cultural materials from access tracks that were needed to complete the EIS in June 2022, during the finalisation of the report in November 2022, and variously for information in response to RAP enquiries.
- Notification of the initiation of archaeological test excavations for the Project as required by the *Code of Practise for the Archaeological Investigation of Aboriginal Objects in NSW* guidelines – 29 August 2022 (Appendix B.1).
- Provision of a summary of findings and proposed finalisation process for the ACHA following the completion of the test excavations – 21 October 2022 (Appendix B.5).

3.3.2 Liaison by OMPS Pty Limited

OMPS Pty Ltd is committed to consultation that is open, accessible, and encourages genuine and meaningful engagement with the Project.

OMPS Pty Ltd commenced early consultation for the Project – including with Aboriginal peoples, communities, and businesses – in 2017. Community consultation has continued throughout the development of the project, including following the issuance of the SEARs (2020) and the ongoing development of the project EIS.

Specifically, regarding Aboriginal consultation, the project team has primarily engaged with the following organisations:

- Thungutti Local Aboriginal Land Council.
- Kempsey Local Aboriginal Land Council.
- Armidale Local Aboriginal Council.
- Dunghutti Elders Council.
- Thungutti Traditional Owners Committee.
- Macleay Valley Aboriginal Community Controlled Forum.

OMPS’ consultation approach has included face-to-face meetings; community information ‘drop-in’ sessions; printed and electronic newsletters and factsheets; development of a project website, email address, social media channels, and a toll-free contact number; sponsorship of community events (e.g. a community breakfast at the Thungutti LALC), as well as the establishment of a Community Information Hub in Kempsey.

OMPS Pty Ltd also engaged an Indigenous Liaison Officer with established connections to the region and community. This important role assisted with the organisation and delivery of key cultural heritage work, and the communication of environmental and planning milestones. The role also ensured that our practices were informed by cultural awareness and protocols.

While no region-specific protocols have been presently issued by the NSW Government, the Oven Mountain project has reviewed and adopted the principles stipulated in the First Nations Guidelines. This includes recognition of the opportunities afforded by the NSW Electricity Infrastructure Roadmap and Electricity Infrastructure Investment Act 2020 (NSW), as well as the need for meaningful engagement, and the implementation of skills, education, and employment initiatives that foster prosperity for Aboriginal communities.

In March 2022, the Oven Mountain project team developed an 'Aboriginal Participation Strategy', which details broader engagement with local Aboriginal employment service providers and local Aboriginal construction suppliers. The Strategy serves as a preliminary framework for future collaborative engagements with Aboriginal stakeholders regarding skills, training, and education initiatives.

OMPS has since engaged a First Nations Engagement manager to further develop engagement plans and programs.

OMPS Pty Ltd will continue to liaise with Aboriginal peoples, communities, and businesses throughout the development of the Project.

3.3.3 Liaising with the RAPs

Aboriginal consultation for this Project has been undertaken in accordance with procedures set out in Section 3.2.1 and included over 100 interactions with the RAPs between August 2021 and November 2022 (Table 3.1; Appendix B.1); and over 280 person days of on-site participation.

Initial stages of the consultation process identified 52 Aboriginal stakeholders in the region (Appendix B.2). Following notification, 14 organisations and/or individuals registered an interest in the early stages of the Project (September to October 2021); and a further five Aboriginal individuals and/or organisations registered later in the Project (February to June 2022) (Appendix B.3). The RAPs include a large number of local Aboriginal organisations and/or individuals based in Kempsey, Armidale, Bellbrook and/or immediate surrounds, as well as a smaller proportion that are based in Sydney, Gunnedah and Wollongong but have ancestral connections to the region. These later organisations registered largely after the main on-site investigation activities for the ACHA had been completed. The Project has registered any Aboriginal organisation and/or individual throughout the Project regardless of when they have become known or identified their interest. However, where involvement has occurred late in the Project, on-Country opportunities has been limited.

A second notification process was undertaken in February – March 2022 since it was identified that a portion of the Project area had not been included in the original consultation process. This process did not identify any additional registered Aboriginal parties as compared to the original process.

Table 3.1 provides a summary of the main steps undertaken to conform with Heritage NSW guidelines.

A summary of the additional activities outlined in Section 3.2.2 included:

- RAP requested meeting – briefing the Thunggutti LALC on the Project and required assessment process – 27 August 2021.
- Aboriginal focus group meeting 1 (introduction to Project and assessment aims and methods) – 30 November – 1 December 2021.
- RAP requested meeting – a Thunggutti led meeting to discuss who speaks for Country and to determine participation processes for on-site activities – 8 December 2021.
- Aboriginal focus group meeting 2 – discussion of on-site activities, including timing, personnel and requirements. The important cultural site of Carrai water-holes was also discussed as to the level of assessment and investigation – 11 March 2022.

- Aboriginal focus group meeting 3 – follow up from the second meeting to further discuss with identified Aboriginal participants further logistical and contractual details – 7 April 2022.
- Aboriginal focus meeting 4 – discussions on the intellectual property and ownership of data accrued by the Project – 18 April 2022.
- Field survey of construction envelope with the participation of seven RAPs – 2 May – 10 June 2022.
- RAP requested meeting – meeting with the on-site participants to discuss the logistics and WHS requirements of the Project following identification of steep terrain and poor visibility – 4 May 2022.
- RAP requested meeting – meeting to discuss the management of cultural materials (stone artefacts) identified on access tracks across the construction envelope, and which needed to be used to undertake the assessment – 11 May 2022.
- RAP requested meeting – meeting with the Dhungutti Elders Council to provide an outline of the Project, assessment process, activities achieved to date, and next steps – 12 July 2022.
- Collection of cultural materials on access tracks within the construction envelope – following discussions with RAPs and Heritage NSW, cultural materials present on numerous internal tracks were collected and relocated to minimise harm for the remainder of the EIS process – 13–14 July 2022.
- Test excavations of the construction envelope with the participation of between 5 and 7 RAPs – 12 September to 14 October 2022.
- RAP requested meetings – discussions to identify issues associated with the test excavations, mostly in relation to number of participants and length of the proposed program – 23 and 26 September 2022.

Table 3.1 Summary of Aboriginal consultation undertaken for the Project

Consultation Stage	Description	Date Initiated	Date Completed	Notes
1	Government Agency Pre-Notification	2 September 2021 -		Additional details provided in Appendix B.3.
	Advertisement in <i>The Macleay Argus</i>	1 October 2021 25 February 2022		A tearsheet is provided in Appendix B.3.
	Notification and registration of potential Aboriginal stakeholders	30 September 2021 24 February 2022	15 October 2021 11 March 2022	Additional details are provided in Appendix B.3.
	Advising Heritage NSW and Thunggutti LALC of RAPs	12 November 2021		Additional details are provided in Appendix B.3.
2/3	Presentation of information about the proposed project; and gathering information about cultural significance	11 November 2021 24 February 2022	9 December 2021 28 March 2022	Additional details are provided in Appendix B.4.
	Field survey	2 May 2022	10 June	Additional details are provided in Chapter 7
	Distribution of an excavation methodology for review and comment		10 August 2022	7 September 2022 Additional details are provided in Appendix B.4

Table 3.1 Summary of Aboriginal consultation undertaken for the Project

Consultation Stage	Description	Date Initiated	Date Completed	Notes
	Test excavations		12 September 2022	7 October 2022 Additional details are provided in Section 7
4	Review of draft ACHA report	25 November 2022	23 December 2022	Additional details are provided in Appendix B.5.

Table 3.2 List of registered Aboriginal parties for the Project

Organisation	Contact	Location	Date of registration
Thunggutti Local Aboriginal Lands Council	Arthur Bain	Bellbrook	1 September 2021
Three Ducks Dreaming	Lenny Wright	Wollongong	3 September 2021
Dunghutti Elders Council	Ngaire Matthews	Kempsey	30 November 2021
Murrabidgee Mullangari	Ryan Johnson	Sydney	30 September 2021
Muragadi	Jesse Johnson	Sydney	30 September 2021
Merrigarn	Shaun Carroll	Seven Hills	1 October 2021
Nunawanna Aboriginal Corporation	Colin Ahoy	Armidale	1 October 2021
AT Gomilaroi Cultural Consultancy	Aaron Talbott	Gunnedah	2 October 2021
Iwatta Aboriginal Corporation	Steven Ahoy	Armidale	4 October 2021
DFTV Enterprises	Derrick Vale	Rutherford	4 October 2021
Bruce Cohen	Bruce Cohen	Armidale	5 October 2021
Gomeroi Traditional Owners	Steve Talbott	Gilleston Heights	5 October 2021
HSB Heritage Consultants (Patricia Hampton)	Patricia Hampton	Kempsey	15 October 2021
Gumaraa Aboriginal Experience Pty Ltd	Richard Campbell	Wollongong	18 October 2021
QMS	Richard Campbell	Kempsey	11 March 2022
Gunjeewong Aboriginal Corporation	Shayne Dickson	Rouse Hill	5 February 2022
Armidale LALC	Colin Ahoy	Armidale	6 May 2022
Gumbaingarr Traditional Owners	Mavis Ahoy		18 May 2022
Wolka Aboriginal Corporation	Simons Haines		17 June 2022

3.4 Aboriginal stakeholder feedback

Aboriginal consultation has been extensive between August 2021 and November 2022, and included over 100 interactions, including 15 discrete meetings with RAPs in groups or one-on-one meetings (Attachment B.1), and some 280 person days of on-site activity. As such, discussions have been wide-ranging, initially focussing on who is relevant to the Project area, then the methods and approach to field investigation, and finally into the potential impacts and management of identified cultural sites and values. Where captured, minutes of the meetings are presented Attachment B.6.

In summary, the main discussion topics have included:

- Who speaks for Country – a significant number of early discussions were focussed on how the consultation process worked and who would speak for Country and participate in on-site activities. Discussions with the Thunggutti LALC that represent a substantive local Aboriginal community in nearby Bellbrook, resulted in limiting many of these opportunities to local Thunggutti people and/or nearby Anaiwan organisations with traditional and contemporary knowledge. All RAPs were, however, included in key components of the consultation process as per Table 3.1.
- Assessment process – understanding how State significant infrastructure (and therefore CSSI) projects are assessed and how Aboriginal heritage fits into this process; and the key components of the ACHA process.
- Concerns were raised throughout the process about the impacts that the Project would have on the Macleay River, both the potential to drain the river and conversely for catastrophic floods in the event of reservoir failure. The former discussions are outlined further in the cultural values mapping (Chapter 5), but in summary the river has both a spiritual relationship with the broader river system – most evident by an increase site in the centre of the river – as well as a contemporary place of value through fishing and camping, etc. It has been relayed during meetings with the RAPs and in the overall EIS, that water withdrawal from the Macleay River would be strongly controlled and would not result in any major change to the current hydrological system. Specifically, EMM's (2022c) ground water study concludes:
 - Numerical modelling predicted a localised reduction in groundwater baseflow contributions from the NEFB Coast groundwater source to the Macleay River (117 ML in construction year 5) and the ephemeral streams (47 ML in construction year 4). During operation of the Project additional (i.e. greater than pre-Project) baseflow contributions are predicted to the Macleay River (212 ML/year of operation) and the ephemeral streams (153 ML/year of operation). There is no impact predicted for baseflow contributions to the Carrai Waterholes.
- There is no impact predicted to the Carrai Waterholes or obligate GDE's [Groundwater Dependent Ecosystems] identified across the plateau, additionally there are no identified high priority GDE's within the Project area. Water table drawdown is predicted at plant communities with a facultative/opportunistic dependence on groundwater, however this has been assessed as low risk due to the particular community's reliance on surface water for sustainment. Specifically, EMM (2022b) concluded that:
 - Water take for the initial storage fill (6,500 megalitres (ML)) represents 1% of the average annual streamflow volume adjacent to the Project area. Water take for operational top-up (up to 770 ML) represents 0.1% of the average annual streamflow volume adjacent to the Project area.

- Extraction for the initial storage fill and operational top-up will occur at a rate of up to 86.4 ML/day which results in a maximum streamflow reduction of 12.6% for short periods of time (i.e. just after extraction commences). This is predicted to result in a maximum water level reduction of 0.05 m (or 5%).
 - Extraction at lower pump-rates (e.g. 1 ML/day) for general construction purposes is predicted to result in less than a 1% impact on the streamflow regime for 90% of Macleay River flow conditions adjacent to the Project area.
- Despite these findings, given the concerns, additional recommendations to further explore cultural flows have been proposed as an outcome of this report (Chapter 11). In relation to catastrophic flooding, recent wet weather in late 2022 has led to more water in the Macleay River system than a complete emptying of the reservoirs would, and as such the local Aboriginal community is now aware of the flooding capacity of the river.
 - Carrai Waterholes – as a gender-specific (male) site, information presented on this site in the ACHA is limited. This is a significant cultural site – an identified Aboriginal Place – located about 4.5 km south of the disturbance footprint and was periodically raised in discussions. Specifically, whether the Project would have an adverse impact on the water-holes. While initially the local Aboriginal community was supportive for EMM personnel to visit these sites and undertake investigations – mostly in relation to surface and ground water monitoring – this was eventually rejected, and no on-site activities were authorised. As such no direct data was obtained from this site, although it is a substantial distance from the Project area, and neither direct nor indirect impacts are expected. Specifically, EMM’s (2022c) ground water study conclusions are outlined above.
 - Cultural values mapping – understanding the intangible and spiritual values of the Project area, sourced from both traditional and contemporary information, and subsequently discussions on the findings of these investigations towards the end of the Project (Chapter 5).
 - Management of cultural materials during the EIS process – numerous stone artefacts were present on access tracks and unsealed roads running through the Project area, and which were essential for completing the EIS assessment process. Ultimately, a process of consultation was undertaken with all RAPs and Heritage NSW outlining a range of possible options around the collection and relocation of these artefacts. Subsequently, all artefacts were collected by the RAPs and relocated to a secure storage box within the construction envelope near their original location.
 - Field survey and excavation participation – a continual discussion with those individuals and/or organisations identified for on-site activities to maximise on-site participation, both in relation to numbers of participants and length of time on site. This resulted in numerous additions and extensions to the field programs across the ACHA process.
 - Field survey and excavations findings – the nature of cultural materials found within the construction envelope, and how they may be further investigated, managed and/or protected into the future. Sites of importance focussed upon an avoided axe quarry overlooking the confluence of Georges Creek and Macleay River, and upon a high-density artefact scatter found on transect 7 during the excavation program. Other references included a number of stone arrangements (many of which appear to follow a historical road through the Project area) and a post-Contact camp – often referenced as a mission, but there is no documentary evidence of this – on the western bank of Georges Junction (Chapter 7 and 8).

- Concerns over the impact to the cultural landscape – despite the level of interaction and on-site activities, there remains mixed views within the local Aboriginal community over the Project and its potential impacts to the tangible and intangible values of the locale.
- Concerns over a bridge crossing from the construction envelope across to Georges Junction – early discussions and concepts include a possible bridge over the Macleay River at Georges Junction. This alignment was discontinued and does not form part of the current Project.

The outcomes of these discussions have been considered in the development and content of the ACHA. While not necessarily individually mentioned throughout the report, they have nonetheless been considered throughout the formulation of the ACHA.

A copy of the ACHA has been provided to the RAPs (Table 3.1). An original draft was provided on 25 November 2022, and a meeting was undertaken to discuss the report on 15 December 2022 at the OMPS office in Kempsey. All RAPs were invited to attend, and the meeting was ultimately attended by Richard Campbell (QMS). Where required, changes have been made to the report text where appropriate, and comments provided during this process are set out in Appendix B.5 and B.6 and summarised below:

- Overall, there were few concerns or issues raised with the report, its findings or proposed recommendations. Much of the AFG meeting covered clarifying aspects of the assessment, and potential future training and employment opportunities for local Aboriginal people. The timing of further work proposed in the ACHA recommendations (eg validation of ‘tentative’ sites, and completion of the test excavation) was also discussed, though no issue was raised with the recommendations themselves, nor the proposed assessment methods.
- Following a lengthy discussion of the cultural values study, two issues were discussed:
 - It was determined that while it was unlikely that including additional representatives would result in substantively different information being captured, additional participation may be considered if specific individuals were to be nominated. It was generally agreed, however, that the same places and stories were generally being told by many of the participants, and a common cultural landscape was becoming evident.
 - Rather than finalising the report via written and remote verbal communication with the participants to finalise the cultural mapping report, an in-person process was suggested. This would ensure suitable explanation as to the ‘redaction’ process required and the eventual use of the report for the Project; and that this process should ensure that an Aboriginal person with greater knowledge of the cultural heritage management process attends these discussions.
- Richard Campbell provided additional context on the Lower Creek/Long Flat Camp site identified during the cultural mapping study, and elaborated on some of its features; and outlined another possible location for the site beyond those in the documentary record.

No further comments were received.

3.5 Next steps

Consultation with the RAPs and local Aboriginal community is proposed to continue following the completion of the ACHA. As outlined in Section 3.3.2, an Aboriginal Participation Strategy was completed in 2022 and a more detailed Aboriginal Participation Plan is currently under development. A First Nations Engagement manager has also been recruited for the Project.

In addition, the recommendations of the ACHA include ongoing consultation in the development and implementation of several management plans required in subsequent stages of the Project.

4 Existing environment

4.1 Key findings

- The Project area is dominated by two main environments:
 - i) Moderate to extremely steep relief encompassing most of the Project area, and characterised by mid, upper slopes, spurs, and undulating ridgelines surrounding the peak of Oven Mountain. Numerous minor, likely ephemeral tributaries run from across these high grounds down to the Georges Creek and Macleay River.
 - ii) Alluvial floodplains and gentle to moderate lower slopes running along the Georges Creek and Macleay River corridors that form the western and northern boundaries of the Project area. These environments would have contained a variety of resources that would have been attractive to Aboriginal people in the past, but also would have influenced the potential cultural materials that may have been deposited and survived. While the terrain is steep, there is little evidence of vertical escarpments where rockshelters (or associate features) would be expected. Conversely, the potential for culturally modified trees where remnant vegetation remains, grinding grooves, and surface and subsurface stone artefact material – the latter especially along the river corridors – have greater potential to be present in these environments.
- A detailed field investigation of the soil profiles was undertaken focussing on the construction envelope. These found primarily shallow soil profiles, which limit the potential for deep cultural materials to be present and making them more prone to movement and/or loss through natural erosion processes. One deeper alluvial soil profile is found in the eastern portion of the EAR, and that may be of archaeological interest depending on the age of formation.
- The Project area and locale contains a wide variety of flora and fauna that would have been used by Aboriginal people in the past for food, medicinal, totemic and cultural purposes. An extensive description of flora and fauna of importance to the contemporary Aboriginal participants was documented as part of a cultural mapping study. These include both native and introduced species, the latter demonstrating the high adaptability of past and contemporary Aboriginal people to integrate useful resources into their established food, medicinal and cultural practises.
- The Project area has been subject to both natural and anthropogenic disturbance that will affect the survivability of cultural materials if present. These include primarily pastoral and vegetation clearance along the Macleay River corridor and western portions of the Project area, which would have had the likelihood of removing any culturally modified trees if present and de-stabilising the shallow soil profiles and adversely affecting any stone artefactual material. However, more extensive mining activities in the region are not documented within the Project area, and many parts of the site appear relatively unchanged since at least the mid-20th Century noting that much vegetation is represents regrowth from past logging activities (see also Section 4.9).

4.2 Rationale

Understanding environmental context assists with predictions of archaeological potential, such as the likelihood of archaeological material being present in the landscape, its spatial distribution and its preservation. Landscape features were an important factor for the choice of camping and transitory and ceremonial areas used by Aboriginal people. Similarly, these landscape features and historical land-use plays a role in the level of preservation and the integrity of archaeological sites.

A landscape consisting of suitable topography, hydrology, geology and soils has strong links with natural resources that would have been available to, and sought after, by Aboriginal people. Flora and fauna would have provided food, tools and ceremony (culturally modified trees); proximity to fresh water was necessary for life and growing crops, as well as gathering fish and eels. Landscape features, such as sandstone overhangs, were useful for shelter; stone artefacts were manufactured from raw stone material that was collected from quarry sites; and stone arrangements relied on the landscape.

4.3 Landscape overview

Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that capture large-scale geophysical patterns at an ecosystem scale. Sub-regions delineate significant geomorphic patterns within a bioregion, and are based on finer differences in geology, vegetation and biophysical attributes (Bannerman & Hazelton 1990).

The Project area is within the NSW North Coast bioregion and is closely bordered by the New England Tableland bioregion to the north and west. Within the NSW North Coast bioregion, the Project area sits within the Nymboida subregion, which is characterised by the foothills of the Great Escarpment with steep slopes with relief of up to 750 metres (NSW National Parks and Wildlife Service 2015; more accurate LIDAR for the Project area suggests slopes up to 1,000 metres). The geology of the subregion consists of faulted bedrock of Devonian slates and quartzites, Permian mudstones and lithic sandstones both intruded by granodiorites. Areas of Tertiary age basalts can be found along the margins of the Great Escarpment. Typically soils of the subregion are dependent on the underlying geology; on basalts and granodiorites, red earths and red loams are present, and on volcanic and sedimentary rocks soils containing a red and brown texture contrast are present.

The existing environment heavily influences the potential types of cultural material that may be present within a Project area. For example, geological formations, notably rock outcrops, are essential for rockshelters and associated features (such as art), while exposures of smooth geology observed along creeks and rivers may also be suitable for sites such as grinding grooves. The potentially deep soil profiles along the river's edge have potential for buried cultural material, such as stone artefacts and shell. However, it should be noted that while the presence of major water courses would have been a key resource for past occupation, they can be subject to significant flooding and scouring. As such, evidence of past occupation may be more likely to survive on elevated areas (e.g. terraces) above these water courses, despite the likelihood that these riverbanks are likely to have been heavily used in the past.

4.4 Topography

The Project area topography is presented in detail in EMM (2022d). In summary:

- Upper and lower reservoirs – this locale is steep, sloping predominantly to the west from the high point of Oven Mountain, located to the southeast of the Project area at an elevation of 1,147 meters relative to Australian Height Datum (m AHD). The topography of the plateau area is relatively level at an average elevation of approximately 1,000 metres m AHD. The escarpment dips down to the west and north-west from the plateau, where the relief levels out at an average elevation of 145 m AHD along the Macleay River floodplain. The escarpment is dominated by a series of steep scarp slopes ranging between 20 and 30° (NSW SS 2017a).
- Eastern access road – this locale runs east to west on the south side of the Macleay River for its western end before turning to the northeast and continuing east. The construction envelope runs generally parallel to the 150 m AHD contours of the lower hillslopes, then continues to run east from the junction, crossing the ridge at approximately 200 m AHD before reaching the Macleay floodplain at approximately 130 m AHD (NSW SS 2017a, 2017b).

- Transmission corridor – the transmission corridor will contain up to two transmission lines, a 132 kV single circuit overhead line, and a 330 kV double circuit overhead line that will sit alongside each other within the transmission corridor to minimise overall impacts. The transmission corridor will follow the route adjacent to the main access road travelling north from the switchyard at the ECVT portal (approximately 300 m AHD), crossing over the Macleay River approximately 1.5 km east of Georges Junction (approximately 125 m AHD) before rising up to connect with TransGrid Line 965 at approximately 576 m AHD.

While many of these environments are steep, few areas exceed 80° (Figure 4.1), and as such the potential for vertical or near-vertical escarpments within which rockshelters (or associated features) may be expected are not generally present within the Project area. The only notable exception is a small escarpment that runs north from the upper reservoir (and outside of the construction envelope). This escarpment was not inspected by the ACH team due to the potential dangers for some of the elderly members of the team. However, ecology investigations of the escarpment found few caves or overhangs, and where present were extremely small.

4.5 Geology

The Project area lies within the New England Orogen (NEO). The NEO extends approximately 2,000 km along the east coast of Australia from Townsville, QLD (north) to Newcastle, NSW (south), and is bordered by the Sydney-Gunnedah-Bowen Basin to the west (Jessop et al. 2019). Differing geodynamics in the early Permian to Triassic led to a series of linked pluton structures (known collectively as the New England Batholith) which intruded the sedimentary units of the Permian-aged Parrabel Beds and Carboniferous-aged Pee Dee Beds. The Triassic -aged Carrai Granodiorite; a plutonic structure outcropping over approximately 168 km², is the dominant geological unit occurring within the Project area and a product of the New England Batholith.

The geologic formations within the Project area consist of the Upper Permian New England Batholith formation on the ridges and slopes with Quaternary Alluvium associated with the Macleay River flats. The Upper Permian formation located within the Project area on the Carrai Plateau is characterised by rolling hills, flats and steep slopes with abundant granite and granodiorite rock outcropping. The geology of the Carrai Plateau is not conducive to Aboriginal stone tool production. Aboriginal people were most likely sourcing lithic raw material for tool making from the river cobbles transported by the Macleay River from elsewhere. The near vertical escarpment west of the Carrai Plateau may have the potential to contain rockshelters, although this is considered limited by the accessibility to these areas.

A summary of the stratigraphy within the Project area is provided in Table 4.1. The distribution and extent of the relevant geological units to the Project area are mapped and shown in Figure 4.2.

Table 4.1 Stratigraphy within the Project area

Period	Formation	Typical Description (Colquhoun, et al 2022)
Quaternary	Undifferentiated alluvial, colluvial sediments	Well sorted, coarse grained and oversized fractions at the base of the incised valleys and adjacent to the Macleay River. Generally, comprises localised deposits of cobbles and boulders at the base of the incised valleys, becoming more prevalent and continuous within the lower escarpment. Sands to cobbles more frequently observed within the Macleay Valley floodplain.
Triassic	Carrai Granodiorite	Coarse grained, felsic, crystalline igneous rocks including granodiorite, monzogranite and leucogranite. Relatively shallow weathering profile (≤9 m depth) and strength typically increasing with depth. Dominant geology underlying the Project area.
Carboniferous to Permian	Nambucca Beds	Permian metasediments, at least 3–4 km thick. The lower Nambucca Beds (Parrabel Beds) are dominated by diamictites. The upper Nambucca Beds (Pee Dee Beds) are dominated by fine-grained sediments with conspicuous soft micaceous sandstones and siltstones (Eddie 2018).

Table 4.1 Stratigraphy within the Project area

Period	Formation	Typical Description (Colquhoun, et al 2022)
Permian	Parrabel Beds	Fine to coarse grained sedimentary rocks including diamictite, conglomerate, sandstone, mudstone, limestone and tuff. Highly metamorphosed within the project area by the Carrai Granodiorite intrusion, forming an aureole contact of hornfels and meta-sediments. Underlies the majority of the western catchment.
Carboniferous	Pee Dee Beds	Fine to coarse grained sedimentary rocks including slaty siltstone, lithic sandstone and minor diamictite. Likely metamorphosed near the project area by Carrai Granodiorite intrusion, forming an aureole contact of hornfels and meta-sediments. Underlies the northern portion of the western catchment and a small component of the Macleay River floodplain.

4.6 Soil landscape

Soil landscape classifications and their boundaries provide pre-defined areas that are classified by several geographic features, and which are informative for the archaeological investigation. They provide localised information including landform patterns, soils, geology, rock outcrop percentage, land use and vegetation. This information provides another layer to categorise the landscape for the predictive model, additional to what a topographic description can provide. Soil landscape information builds on underlying geology and describes the depths of residual soils and colluvial soils and identifies areas that are characterised by erosion or skeletal soils and exposed bedrock versus those that may contain a deeper profile where cultural material may be buried.

Based on publicly available Australian soil classification mapping data (DPIE, 2021), the soil groups mapped within the Project area include Kandosols, Kurosols, Tenosols and Rudosols (refer to Table 4.2 and Figure 4.3). In general, these soil groups are observed (DJPR, 2020):

- to be relatively shallow, with rock close to surface
- comprising minimal clay content ($\leq 15\%$)
- exhibiting poor water holding capability.

Soils within the Project area are predominantly residual, with their composition influenced by the properties of the underlying rock unit. In general, residual soil overlying the:

- granitic rock (granodiorite, adamellite and monzogranite) typically comprising of pale grey, medium grained sand with minor clay inclusions
- metamorphic rock (hornfels and metasediments) typically comprising of dark grey, medium–high plasticity clay.

Typically, cultural materials – stone artefacts – are constrained to the topsoil or upper soil units, generally <1 m below the current surface. These soil landscapes indicate that the soil profile is fairly shallow and given the topography potentially highly mobile and erosive. As such, the potential for significant buried cultural materials within these soil landscapes is considered limited.

Deposits of alluvial and colluvial soils occupy the incised valleys which support the ephemeral streams formed across the upper escarpment area (refer Section 4.7). The deposits become more substantial in the lower escarpment and plain area (further along the geomorphological profile of the streamline), reflecting the increased energy of the environment and wider catchment area, and generally comprise sub-rounded to rounded boulders, cobbles, gravel and sand. Further down the catchment, within the riparian corridor and along the fifth order Macleay River, the surficial geology is comprised of a relatively thin deposit of alluvium, comprising well rounded cobbles, gravel and sand. Such environments are more conducive to retaining buried cultural materials, with examples of stone artefacts recovered from >4 m in areas of the Hawkesbury Nepean River in recent years.

Table 4.2 Summary of regional ASC soil mapping

Soil Type	ASC description ¹	Agricultural potential ²
Kurosols (KU)	<ul style="list-style-type: none"> • Soils with strong texture contrast between A and <i>strongly acid</i> B horizons. • Soils other than Hydrosols with: <ul style="list-style-type: none"> – with a <i>clear or abrupt textural B horizon</i> – in which the major part of the upper 0.2 m of the B2t horizon (or the major part of the entire B2t horizon if it is less than 0.2 m thick) is <i>strongly acid</i>. • Many of these soils often have some unusual subsoil chemical features, such as high magnesium, sodium and aluminium. 	<ul style="list-style-type: none"> • Generally low agricultural potential. • High acidity, low chemical fertility, generally low water holding capacity. • Frequent sodic conditions.
Kandosols (KA)	<ul style="list-style-type: none"> • Soils that lack strong texture contrast, have massive or only weakly structured B horizons and are not calcareous throughout. • Soils other than Hydrosols which have all the following: <ul style="list-style-type: none"> – B2 horizons in which the major part has a grade of pedality that is massive or weak – a maximum clay content in some part of the B2 horizon that exceeds 15% – do not have a clear or abrupt textural B horizon – are not calcareous throughout the solum, or below the A1 or Ap horizon or to a depth of 0.2 m if the A1 horizon is only weakly developed. 	<ul style="list-style-type: none"> • Generally low to moderate agricultural potential. • Moderate chemical fertility and water holding capacity.
Tenosols (TE)	<ul style="list-style-type: none"> • Soils with generally only weak pedologic organisation apart from A horizons, excluding soils with deep sandy profiles with a field texture of sand, loamy sand or clayey sand in 80% or more of the upper 1.0 m. 	<ul style="list-style-type: none"> • Generally low or very low agricultural potential. • Typically, very sandy with low chemical fertility, water holding capacity and structure. • Alluvial soils can often have high agricultural potential.
Rudosols (RU)	<ul style="list-style-type: none"> • Soils with generally little, if any, pedologic organisation apart from: <ul style="list-style-type: none"> – minimal development of an A horizon, or – presence of less than 10% of a B horizon in fissures of the parent material or saprolite. • The soils are apedal or only weakly structured in the A1 horizon and show no pedological colour changes apart from the darkening of an A1 horizon. • Typically, young soils in the sense that soil forming factors have had little time to pedologically modify parent rocks or sediments. • Component soils can vary widely in terms of texture and depth; many are stratified and some are highly saline. 	<ul style="list-style-type: none"> • Most have low or very low agricultural potential. • Typically thin, rocky and/or sandy with low chemical fertility. • Alluvial soils are often deep, fertile and have high agricultural potential.

1. per Isbell & NCST (2021)

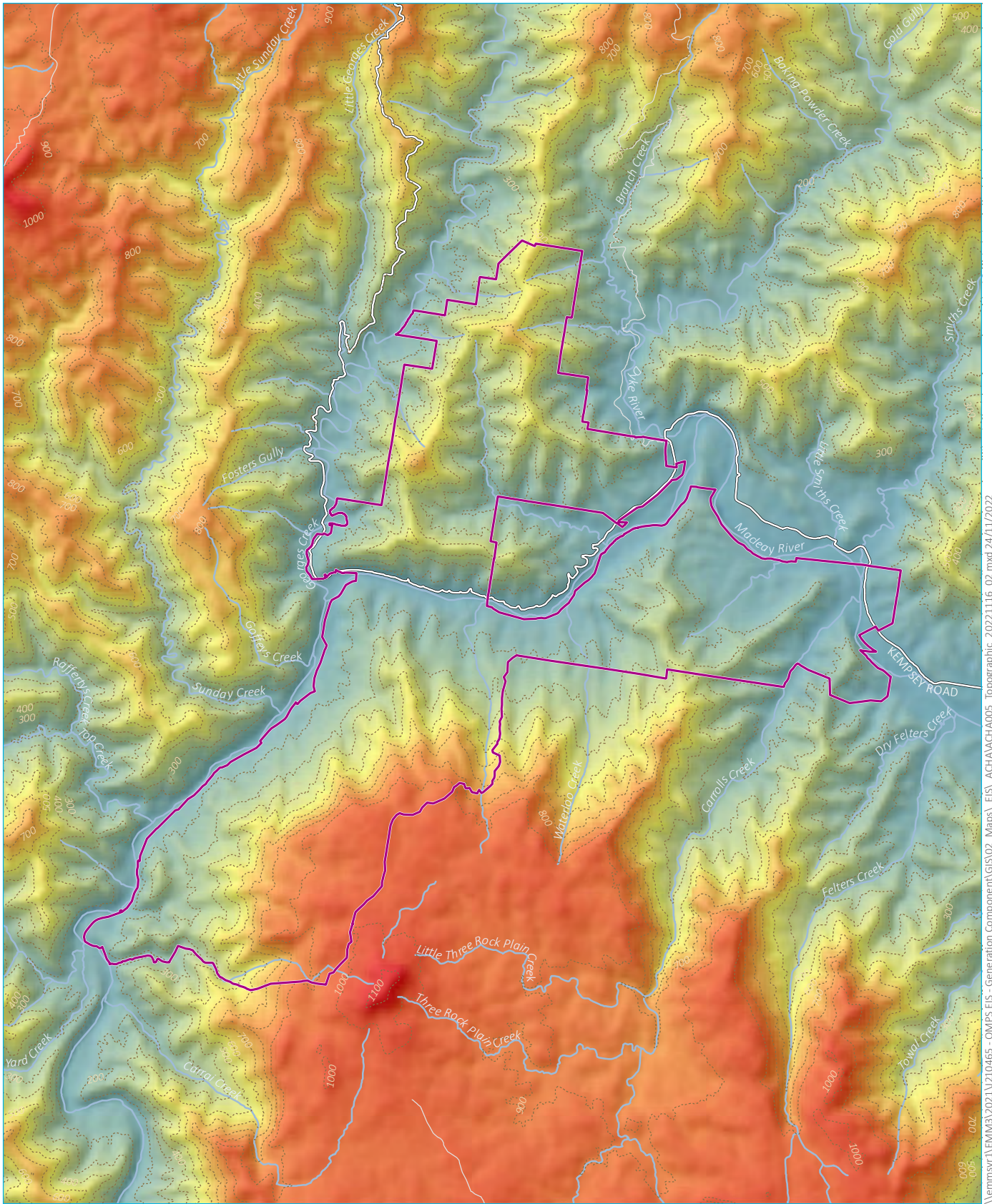
2. Per Gray and Murphy (1999)

4.6.1 EMM (2022d) – on site observations

As part of the EIS, an on-site investigation of the soils was undertaken by EMM. These samples 53 locations across the construction envelope and identified four main soil mapping units (Figure 4.3). These soil mapping units variously combine and refine the regional soil mapping information outlined in Section 4.6 specific to the construction envelope. The soil mapping units can be summarised as follows:

- SMU A – soils primarily of deep, weakly structured soils with sandy and loamy textures, with occasional presence of weakly to moderately structured clay loams at depth. This SMU includes Arenosols, Tenosols, Rudosols and Dermosols.
- SMU B – soils with heavier textures and soil structure than seen in SMU A, consisting of clay loam to clay soils with at least weak to moderate structure at some point in the subsoils, being classified as Dermosols.
- SMU C – soils with heavier textures and soil structure than seen in SMU A, consisting of clay loam to clay soils with at least weak to moderate structure at some point in the subsoils, being classified as Dermosols.
- SMU D – alluvial Tenosol soils associated with the alluvial terraces and floodplains in proximity to the Macleay River. This SMU will be inherently variable due to the nature of alluvial soils from the temporal and spatial variability of flooding and inundation events and the subsequent development of soils.

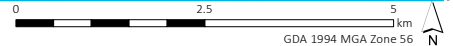
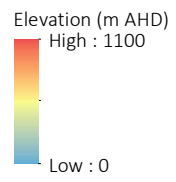
From an archaeological perspective, with the exception of SMU D, all other parts of the Project area are characterised by soil profiles that have thin topsoils before clay (B horizon) or rock (C horizon) units are encountered. As such, the potential for deep buried cultural material is considered improbable. SMU D appears to have the potential for deeper soil profiles and is constrained to the eastern part of the eastern access road. In these areas, buried cultural materials may be present.



Source: EMM (2022); ABS (2021); DFSI (2020, 2021); GA (2011, 2020)

KEY

- Project area
- Topographic contour (100 m interval)
- Existing environment
- Major road
- Minor road
- Named watercourse

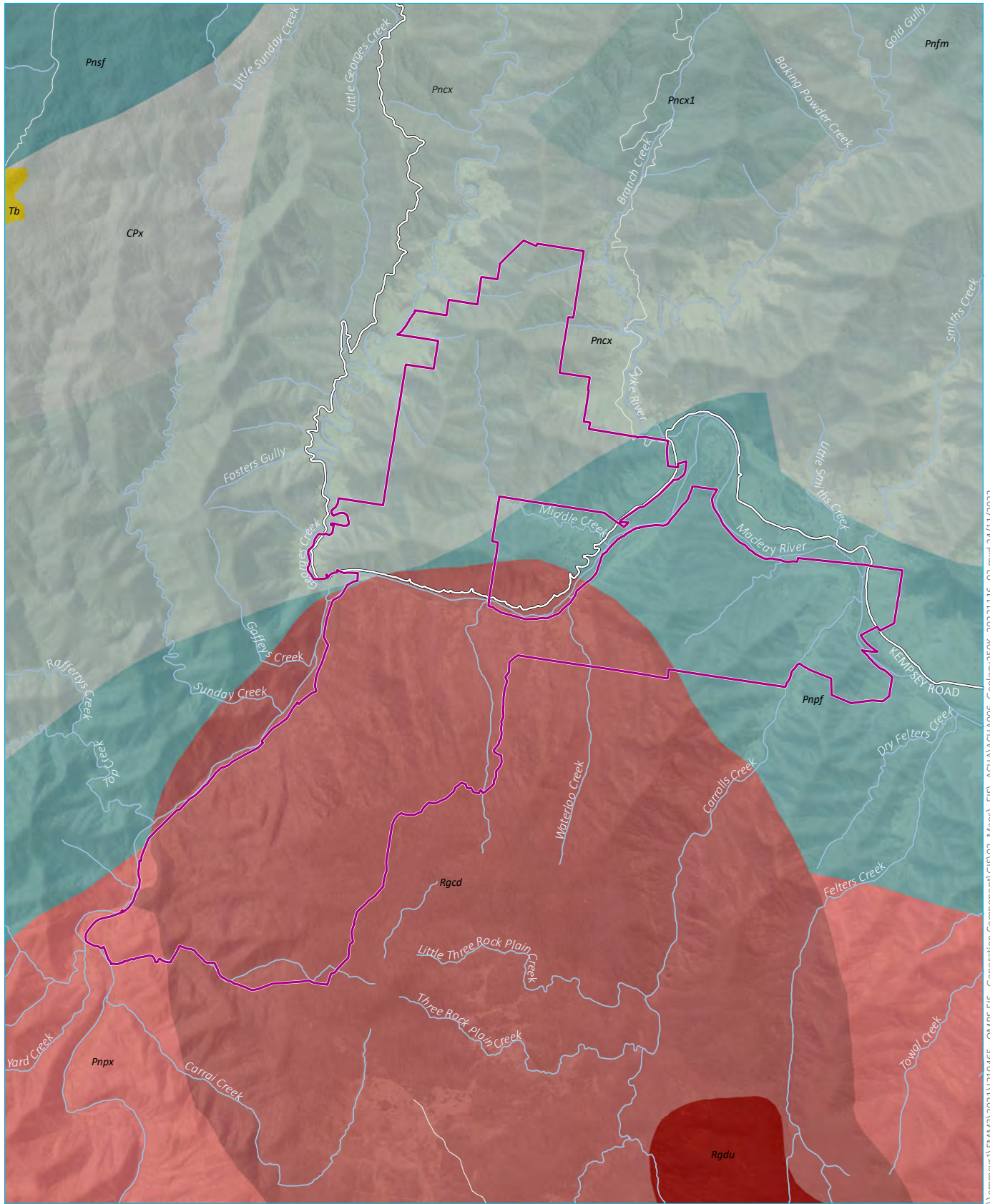


Topography of the Project area

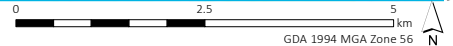
Oven Mountain Pumped Hydro Energy Storage Project
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 Figure 4.1



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Source: EMM (2022); DFSI (2020, 2021); GA (2011, 2020); DPI (2003)



KEY

- Project area
- Existing environment
- Major road
- Minor road
- Named watercourse

- Geology 250k period and formation
- Tertiary
- Tb - Tertiary
- Permian
- Pnpx - Permian, Parrabel bed
 - Rgdc - Permian, Carrai Granodiorite
 - Rgdu - Permian, Daisy Plains Leucoadamellite

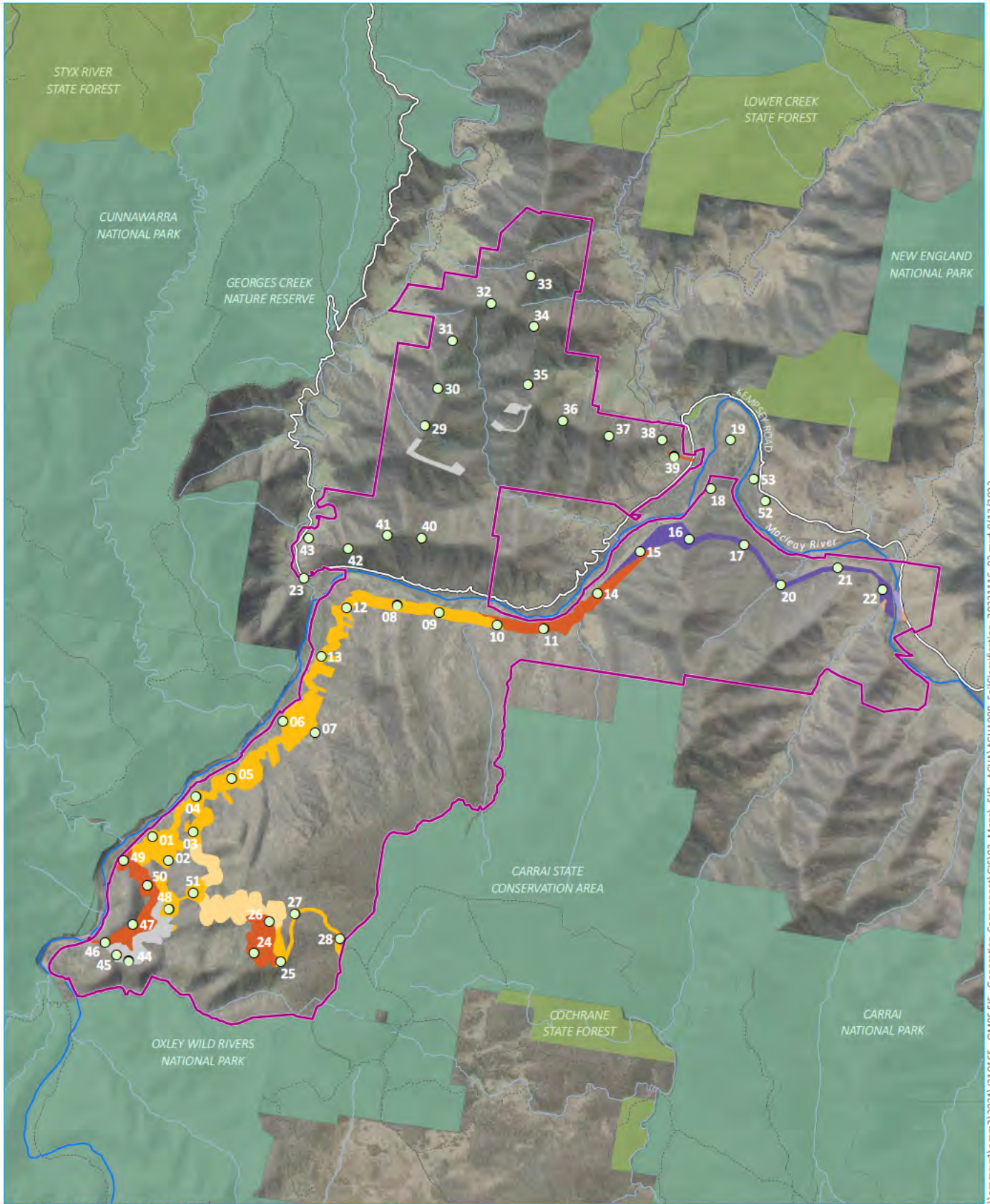
- Carboniferous
- CPx - Carboniferous, Coffs Harbour association
 - Pncx - Carboniferous
 - Pncx1 - Carboniferous
 - Pnfm - Carboniferous
 - Pnfp - Carboniferous, Pee Dee bed
 - Pnsf - Carboniferous

Geology of the study area

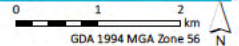
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 Figure 4.2



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Source: EMM (2022); DFSI (2020); GA (2011)



KEY		
 Project area	— Existing environment	 Soil mapping units (SMU)
● Soil survey sites	— Macleay River	 SMU A
	— Watercourse/drainage line	 SMU A - low confidence
	— Major road	 SMU B
	— Minor road	 SMU B - low confidence
	- - - Vehicular track	 SMU C - low confidence
	 NPWS reserve	 SMU D
	 State forest	 SMU D - low confidence

Soil classification of the Project area by EMM (2020d)

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 Figure 4.3



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4.7 Hydrology

The Project area is located within the Macleay River catchment, covering approximately 11,400 km² from Armidale (on the Great Dividing Range of NSW) to Hat Head (on the east coast of NSW). The catchment generally comprises relatively impervious rock at the ground surface, leading to rapid water level and streamflow responses in the Macleay River following rainfall.

Numerous minor tributaries to the Macleay River traverse the Project area in proximity to the proposed works (Figure 4.4). Catchment characteristics across the Project area are generally uniform and are primarily comprised of steep bushland. Upland swamps are observed in the upper reaches of some watercourses while pockets of open grassland are observed at lower elevations. Elevations range from 120 m AHD at the Macleay River to 1,000 m AHD in the headwater catchments.

The Project dams and reservoirs will impound Fingerboard Crossing Creek, a third order tributary of the Macleay River (Figure 4.4). Fingerboard Crossing Creek has a catchment area of 3.3 square kilometres (km²) and drains from the higher elevations of Carrai plateau in the eastern portion of the Project area to the Macleay River immediately west of the Project area. The Project is expected to impound approximately 94% (3.1 km²) of the Fingerboard Crossing Creek catchment; the creek contributes approximately 0.02% of the Macleay River's median annual flow.

Peach Tree Creek is immediately south of the Fingerboard Crossing Creek catchment and forms the southern border of the Project area. Peach Tree Creek is a fourth order watercourse with an 8 km² contributing catchment. While the Project surface works are not anticipated to impact Peach Tree Creek, the proposed underground works have the potential to drawdown the watertable and indirectly impact the flow regime of the creek.

Several named watercourses (Oakly, Waterloo, Needle, and Carrolls creeks) will be traversed by the Eastern Access Road. The transmission line component crosses the Georges Creek, Middle Creek and Dyke River catchments. The remaining watercourses within the Project area are primarily unnamed first and second order streams.

A number of other major water courses are found in close proximity to the Project area, including (Figure 4.4):

- Kunderang Station Creek, originating in the upper western catchment and discharging to the Macleay River within the Macleay River floodplain.
- Three Rock Plain Creek and Little Three Rock Plain Creek, originating in the eastern plateau and discharging to the Macleay River outside (east) of the Project area.
- Georges Creek that runs along the western project area and in parallel with the eastern access road. The confluence of this creek with the Macleay River – Georges Junction – appears to have been an important place of Aboriginal activity in the past.

The Macleay River, a ninth order watercourse, runs next to the western portion of the Project area. The Macleay River is a permanent waterway and a significant landscape feature of the region (Figure 4.1). Ephemeral streams discharge directly to the Macleay River or form upper tributaries to the perennial watercourses. The ephemeral streams typically flow for periods proportional to recent duration and magnitude of rainfall, with relatively high flow events evident from the transported boulders and vegetation.

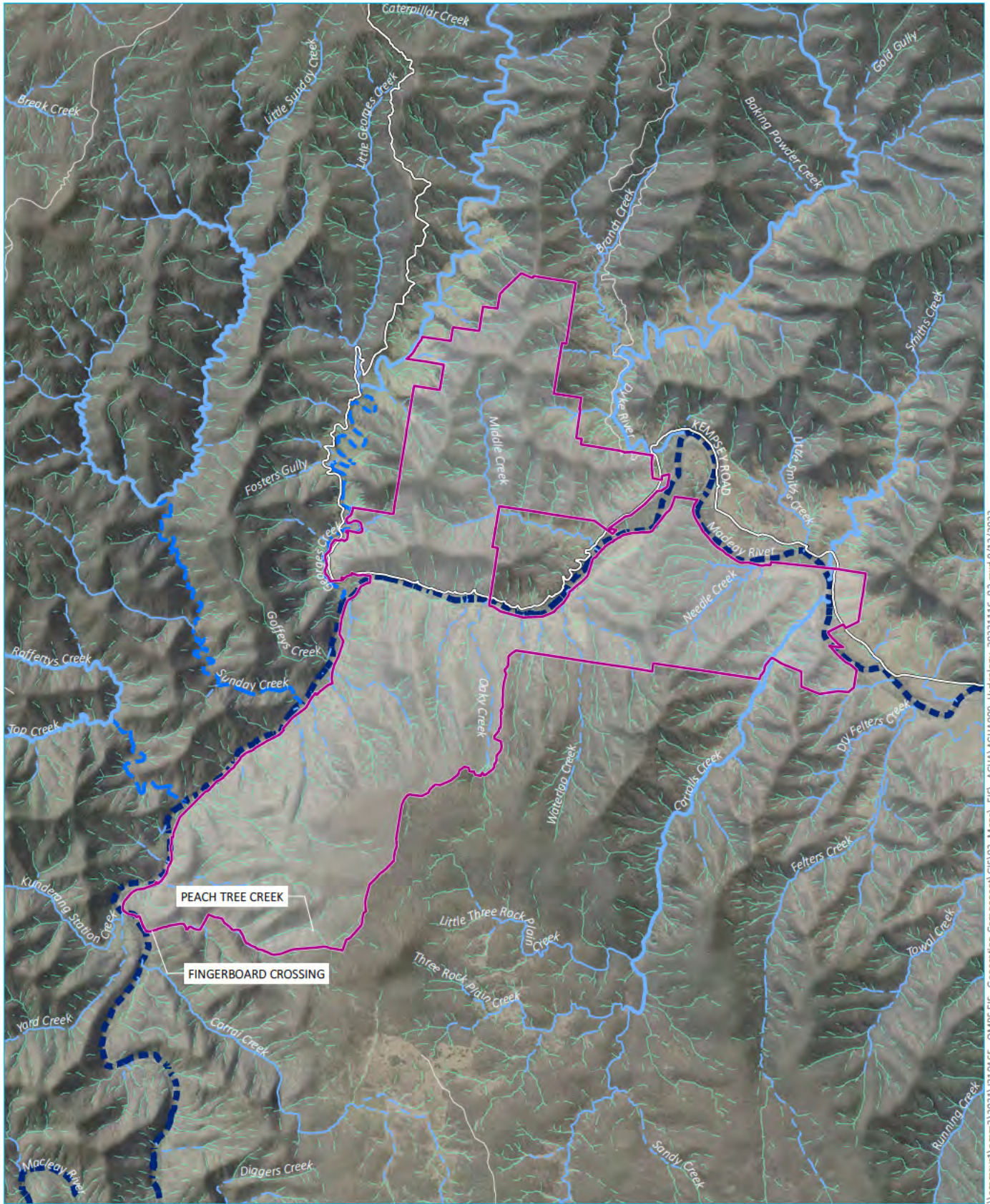
Regional ethnographic and archaeological models (Chapter 5 and 6, respectively) demonstrate the importance both spiritually and economically, of these major river systems to Aboriginal people in the past. It is highly probable that many of these water courses, and especially those with confluences with the Macleay River provided significant resources and have the potential to have retain evidence of past activity and foci. However, it must also be noted that these rivers are subject to significant fluctuations, and this can have an impact on the survivability of these cultural materials, especially where present on the surface. EMM (2022d) states:

Flood flows within the Macleay River are predominantly one-dimensional in nature following the alignment of the river due to the steep longitudinal grade and confined valley setting of the river in the vicinity of the Project area. Several tributaries join the Macleay River near the Project area. However, due to the size of the Macleay River catchment and local topography, flows at each confluence are rapidly incorporated into mainstream flooding.

Under typical streamflow conditions, flows within the Macleay River are confined to the lower channel banks. During flood events, such as the 1% AEP (Annual Exceedance Probability) event, flood levels within the Macleay River are approximately 15 m above typical flow conditions and extend up to 200 m each side of the river across the lower bank floodplain.













In larger (0.1% AEP) and extreme (0.01% AEP) events, flood levels increase above typical streamflow conditions by approximately 18 m and 23 m, respectively. Due to the steep banks either side of the floodplain, flood extents in the 0.1% and 0.01% AEP events are similar to the 1% AEP event and only increase flow widths by about 10 m and 30 m, respectively.

Flood extents and depths of inundation for the Macleay River for the 1% AEP event are presented in EMM (2022b).



Source: EMM (2022); DFSI (2020, 2021); DPI (2015); GA (2011, 2020)

KEY

- | | |
|--|---|
|  Project area |  Strahler stream order |
|  Existing environment |  1st order |
|  Major road |  2nd order |
|  Minor road |  3rd order |
| |  4th order |
| |  5th order |
| |  6th order |
| |  9th order |

Hydrology of the Project area

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 Figure 4.4



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4.8 Flora and fauna

The Project area contains three main vegetation communities. The upper slopes are dominated by the Northern Tableland Wet Sclerophyll forests, with the North Coast Wet Sclerophyll forests on the foot slopes and the Northern Gorge Dry Sclerophyll forests near the Macleay River. These forest communities are characterised by open canopies ranging from about 20–60 m in height, including a variety of eucalypt species, specifically grey gum (*Eucalyptus punctata*) and stringybarks (*Eucalyptus tenella*) in the lower areas with mahogany (*Eucalyptus resinifera*), tallowwood (*Eucalyptus microcorys*), blackbutt (*Eucalyptus pilularis*) and Sydney blue gum (*Eucalyptus saligna*) at higher elevations. Despite widespread cedar logging throughout the region, evidence from historic aerials (Section 4.9) shows that large portions of the vegetation within the Project area have remained largely unaffected at least for the last 100+ years. This needs to be contrasted with the field investigations (Chapter 7) that suggests much of the construction envelope is dominated by young and/or regrowth vegetation.

A number of observed vegetation and fauna of value to the Aboriginal community were also identified as part of the cultural mapping investigations of the Project area (Appendix D). Plants provided food and medicine as well as serving other uses. For example, eucalypts provided bark for huts and as burial shrouds, resin was mixed with ochre and the leaves were (and are) used for smoking ceremonies. Native bees wax was used for its medicinal properties to ward off colds. Waterways were an important source of plants and fish for food as well as attracting other mammals, reptiles and birds. Importantly, a number of the species reflect introduced species, and demonstrate the readiness that Aboriginal people would adopt useful flora and fauna into their diets and habits where beneficial to do so.

These species included:

- Flora:
 - wild gooseberries (*Physalis angulata*) – edible
 - wild cherries (*Syzygium* species) – edible
 - wild passionfruit' (*Passiflora foetida*) – edible
 - wild raspberries (*Rubus parviflorus*) – edible
 - yellow daisy with yams (*Microseris walteri*) – edible
 - bush lemon (*Citrus x taitensis* and *maperara/maperaba*) – edible and used for medicinal properties
 - blady grass (*Lomandra longifolia*) – used to make slingshots
 - 'forest cherry' tree or lillipilli (*Syzygium* sp) – edible
 - kurrajong (*Brachychiton populneus*) – used in hunting and gathering equipment
 - stinking smartweed (possibly *Persicaria decipiens*) – hunting
 - wild figs (*Ficus* species) – edible
 - blackberries (*Rubus* species) – edible
 - blueberry lily (*Dianella revoluta*) – edible
 - bunya pine (*Araucaria bidwillii*) – edible

- sheoak (*Casuarina* species) – medicinal.
- Fauna (hunted unless otherwise specified):
 - bullhead mullet (sea mullet, *Mugil cephalus*)
 - pinkeye mullet (freshwater mullet, *Trachystoma petardi*)
 - perch (golden perch, *Macquaria ambigua*)
 - catfish (freshwater catfish, *Tandanus tandanus*)
 - eel (long-finned eel, *Anguilla reinhardtii*)
 - Macquarie River turtle (*Emydura macquarii macquarii*) – totemic
 - freshwater prawns (*Paratya australiensis*)
 - crayfish (maybe the yabby, *Cherax destructor*)
 - Suttons crayfish (*Euastacus sutton*)
 - witchetty grubs (*Endoxyla* species)
 - eastern grey kangaroo (*Macropus giganteus*)
 - possums (such as the common brushtail possum, *Trichosurus vulpecula*)
 - short-beaked echidna, *Tachyglossus aculeatus*)
 - rabbits (*Oryctolagus cuniculus*)
 - lorikeets (various species)
 - plains turkey (Australian bustard, *Ardeotis australis*)
 - wood duck (*Chenonetta jubata*)
 - carpet snake (*Morelia spilota*) – totemic
 - black duck (*Anas superciliosa*) – totemic.

4.9 Land use and disturbance

Previous land disturbance has a significant impact to the survivability of cultural materials if present. While there are natural processes that can disturb and/or destroy cultural material, more frequently it is increasing urbanisation over the last 200 years that has resulted in the most significant impacts. The history and land-use of the Project area is outlined in detail in the *Statement of Heritage Impact* (EMM 2022a) and summarised below.

The Project area has been subject to various activities that would have affected the landscape since the early nineteenth century. Initially, this was a result of illegal squatting and later legal land holding. Squatting was a landholding practice whereby pastoral properties were established on Crown land outside of the declared colonial limits. In 1829 Governor Darling declared the “limits of location”, an arbitrary boundary drawn through NSW along a semicircular line approximately 400 km from the centre of Sydney within which these activities were permissible (Sydney Living Museum 2017). The Macleay River sat just outside of the northern limits of location, but Port Macquarie penal settlement deterred squatters from the region (Macleay River Historical Society 2002, p.4). With the closure of the settlement in 1830, settlers slowly began to follow the cedar cutters into the fertile lands of the Macleay Valley (NSW Parks and Wildlife Service 2005, 20). In 1836 the legislative council passed the *Crown Lands Occupation Act 1836* which allowed farmers to temporarily occupy land beyond the limits of location, and which encouraged settlers, many of whom were officers from the recently closed Port Macquarie penal colony, to take up large runs along the Macleay River and its tributaries (Harrison 2004, p.66; Blomfield 1986). In 1837, 100 cutters were working the Macleay and their nomadic, “wild” lifestyle was seen by observers to parallel the indigenous peoples around the limits of the NSW colony (Harrison 2004, p.64).

Three squatting runs were established in and in close proximity to the Project area prior to 1843. Sheep were the dominant commercial livestock in the NSW colony during the 1840s, but sheep did not thrive in the dense bushland and mountainous terrain of the Upper Macleay. As such, *Cunderang*, *Long Flat* and *Towel Creek* had shifted focus to cattle by the end of 1840s (*The Sydney Morning Herald* 26 July 1848, p.3). Small areas of mixed agriculture were also established on the runs where land was suitable (Harrison 2004, p.66).

Through the mid-19th Century, as squatting gave way to more permanent ownership and the requirement to ‘improve the land’, increasing land clearing and pastoral activities resulted. Significant improvements were made to *Cunderang*, *Long Flat* and *Towel Creek* over the latter half of the nineteenth century. Homesteads were constructed and the landholders permanently occupied their properties (NSW Parks and Wildlife Service 2005, 20). Stock numbers in the region increased over the 1880s as technological advances in refrigeration and food storage raised demand for meat products as produce could be shipped to overseas markets (Morris 1989). There is evidence of early droving activities, with a specific Traveling Stock Route 1076 gazetted in 1880, and which passes west to east from George’s Creek, crossing the Macleay River into the project area towards “Waterloo Paddock” and Long Flat head station.

Mining activities have also occurred periodically within the vicinity of the Project area. The first record of mining in the region states that copper ore was discovered at Willi Willi, south-east of the Project area in 1891 (Carne 1908). Vigorous mining efforts to extract silver, copper and primary ores occurred at Willi Willi and the surrounding areas over the next two decades with mining activities ceasing in 1909 (Daigle 1993, p.2). Gold and tin were also periodically mined along the various creeks of Carrai (to the east) and near Hillgrove (north west of the Project area) over the late nineteenth and early twentieth century (NSW National Parks and Wildlife Service 2008, p.11). The Carrai miners transported minerals and ore to the Macleay River by mule via the Landers Ridge trail. Mining activities resumed in the 1960s and substantial amounts of gold were recovered from around Carrai (NSW National Parks and Wildlife Service 2008, p.11); and as recently as 2019 mining still occurs at Willi Willi.

Commercial logging in the region commenced in 1946 and reached its peak during the 1960s, which helped support large logging towns such as Daisy Plains and Kookaburra. Selective logging is currently undertaken in the Project area particularly in the southern part around the PHGW. Historical aerial imagery from 1956 (Appendix C) shows large remnants of forest east of Macleay River had been cleared – effectively areas in close proximity to the Macleay River upon which cedar was transported. However, historical aerial imagery extending into the late 20th Century reveals little change from 1956, with increasing regrowth of formally cleared areas and localised tracks.

More recently, the properties on the plateau are used for grazing, small scale farming, and/or dry cropping. On the western edge of the Project area, where it abuts the Macleay River, disturbance has largely been constrained to localised impacts, such as dam construction and drainage modification. A powerline easement, with associated tracks and infrastructure, has also been established here. Notably, much of the upper slopes may remain undisturbed due to their inaccessibility, but conversely may have been subject to significant erosion as a result of the steep topography.

While none of the aerial imagery provides any specific information on flooding, the changes in the hydrology of the Macleay and associated tributaries are considered likely to have resulted in localised changes along the river's edge. This may have resulted in the deposition of alluvium (and within which cultural materials may have been deposited) such as to the north of the eastern access road, but in other areas may have led to scouring and erosion. Indeed, visual observations of the lower reservoir suggest a highly active and dynamic environment at least 50 m beyond the current river's edge, where water and flood debris were clearly evident.

Overall, the Project area has been subject to a range of past disturbances, generally associated with rural and farming activities, with localised logging projects. Mining occurred within the region, but there is no evidence of this within the Project area. Such activities are likely to have resulted in at least localised impacts to cultural materials that may be present on site. Most notably, the potential loss of any culturally modified trees, with the potential for pre-Contact vegetation in much of the construction envelope being limited, especially on accessible areas around Macleay River; and the potential reworking of surface and sub-surface cultural materials from destabilisation of the soil profiles as a result of these activities. However, with the exception of localised areas of high disturbance, such as existing roads and landowner facilities, much of the Project area has limited evidence of significant activities in the past.

5 Ethnography and cultural mapping

5.1 Key findings

- Traditionally, the country in which the Project area is located was occupied by people known collectively as the Thunggutti, who all spoke a related language and shared many cultural attributes, and their descendants today are still based in the Macleay Valley. At the time of European settlement, the Project area would have been part of one or more estates associated with clans as landowning groups within the Thunggutti, although there is no information available on their clan identity.
- The main mythologies documented for the Project area were dominated by supreme beings, such as Baiame, Daramulan and Muni Burrebean, with totemic ancestors being of lesser importance in the records. Numerous creation stories and spiritual sites are documented within the region, with the Carrai water-holes, a gender-restricted (male) site, ~3 km south of the Project area, being frequently cited as of high cultural significance; and reference to a catfish increase site – a natural feature used in ceremonies to improve a resource – located in the Macleay River just south of Georges Junction.
- A review of historical records for the region shows an extensive interaction with Europeans over the last 200 years, including numerous incidences of frontier violence, participation of the Thunggutti community with the cedar getters and pastoral stations encompassing the Project area, and the establishment of reserves and camps throughout the region. No specific post-Contact sites or places are identified within the Project area, although activities at both Georges Junction and Kunderang Station were both in close proximity and would likely have used the Macleay River corridor as a travel route.
- Cultural mapping was undertaken by a highly experienced anthropologist with the participation of key knowledge-holders (and included in Appendix D). Some 12 specific locations were identified in the general region as having traditional, historical and/or contemporary values to the local Aboriginal community. None of these were documented within the Project area. These were focussed around Bellbrook – a focus of contemporary Thunggutti people – and included knowledge and relationships with historical frontier violence, descendants working on pastoral stations, and/or more recent recreational activities, such as fishing. Only a historical and contemporary camp at the confluence of Georges Creek and the Macleay River, and Kunderang Station were documented as being in close proximity to the Project area. Cultural flows were explored and indicated the maintenance of river and creek flows in the Macleay Valley to be crucial to the Thunggutti people. They stated that the river must continue to flow for the benefit of the physical environment, as well as for both their spiritual and physical health.

5.2 Documentary ethnography

Information about the socio-cultural structure of Aboriginal society prior to European contact largely comes from ethno-historical accounts made by colonial settlers. These accounts and observations were often made after significant social disruption due to disease and displacement. As a result, this information is often contentious, particularly in relation to language group boundaries. Therefore, it is likely that language group boundaries were far more diffuse than the arbitrary demarcations drawn by colonial observers that are referenced below.

5.2.1 Regional information

Geographically, the cultural mapping study is located near the eastern escarpment of the New England Tablelands, within the setting of the Macleay River valley and gorges. At the time of European contact, several Aboriginal groups are noted to occupy the Tablelands region, including the *Ngarabal*, *Thunggutti*, *Nganyaywana* (also known as *Anaiwan*), *Kamilaroi*, *Banbai*, *Gumbainggir*, *Bigambul* and *Nganyaywana*. The study falls largely within the traditional country of the *Thunggutti* language group, with alternative spellings/names including but not limited to Dainggati, Dunghutti, Djangadi, Dhungatti, and Tunggutti. *Thunggutti* Country extends over 9,100 km² from Point Lookout south to the MacLeay River headwaters and inland to Walcha. The *Thunggutti* comprised between six and eight dialect groups, with the Nulla-Nulla and the Conderang occupying the Upper catchment of the Macleay River (NSW National Parks and Wildlife Service 2008). In the 1830s, surveyor Hodgkinson noted each dialect group had between 80 to 100 adult members and estimated the population of the *Thunggutti* living in the Macleay River valley was between 660 to 800 adults (Harrison 2004, p 93–94). This estimate, however, is not believed to reflect pre-Contact numbers as the Aboriginal population of New South Wales had already felt the effects of smallpox by this time.

The Project area sits near the boundary of *Thunggutti* country, and the Macleay River Valley was a known travel route between the tablelands and coast (Jill Sheppard Heritage Consultants 2003). As such, the area likely also has associations with the *Nganyaywana* (also known as *Aniwan*) language group to the north-west, *Gumbainggir* language to the north and *Biripi* language to the south.



Plate 5.1 Left: Tindale's map (1974) showing the location of Thunggutti (Dainggati). Right: The Encyclopaedia of Aboriginal Australia showing the location of Dainggatti (AIATSIS: 2022). The blue circle represents the approximate location of the Project area

5.2.2 Local beliefs and ceremonial practices

Information about the beliefs and ceremonial practices of the *Thunggutti* people surrounding the Macleay River come from histories shared by Victor Shepard and Les Smith (*Thunggutti* elders) and other descendants over the 1970s and 1980s (see Creamer 1974; 1981). Like many Aboriginal groups over the East Coast of Australia, it is believed Baiame the sky deity, who Creamer (1981) names Wirromprahl, is central to *Thunggutti* Creation (Davies et al 1993). Baiame created the land and gave people tribe laws, ceremonies, and the bullroarer. The *Thunggutti* hold that mountains and sacred places are the true owners of Country. Creation stories as well as ceremonial and/or ritual activities in the Macleay River valley connected the inhabitants with notable landform features in the region (Creamer 1977).

Special places connected to Creation stories are recorded throughout the Macleay River valley and surrounds. Victor Shepherd (one of the last initiated *Thunggutti*) tells that Nulla Nulla Creek (east of the Project area) was created by the path of the Creation porcupine/echidna (ngugundge) as it escaped hunters who eventually caught and speared the creature near the headwaters of the creek (Creamer 1981). The resting place of ngugundge is marked by a special rock and the story represents how the echidna got its quills. *Thunggutti* descendent Shay Kelly (1989) recounts a different telling of the story where the porcupine was a “bad man” transformed by a medicine man. He was slain by warriors as punishment for killing two children and stealing the tribe’s food (eel). In addition, Point Lookout (AHIMS #21-2-0012) was the resting place of a giant bandicoot and was avoided by local Aboriginal people because of its sacredness (Creamer 1981). The bandicoot had the powers to make the earth tremble and cause gale-force winds and hurricanes through the Belington and MacLeay Valleys. If anyone died from these powers a court was convened to ascertain who had trespassed too close to the creature and guilty members punished (Creamer 1981). On the coast, South West Rocks is said to be the burial site of Creation hero Birroogun, slain in battle with the southern tribes (Creamer 1981). Other Creation creatures known in the area include an eel-like being in the Macleay River, little hairy men and an unpleasant entity with large teeth in the caves of the hills, and min min lights (Cohen 2015).

Oven Mountain is considered an important landmark in the region and ceremonial sites are known to be in close proximity to – but not within – the Project area. Wilung-gajai (AHIMS #21-5-0023), a site where ceremonies are performed to increase numbers of catfish, is located upstream on the Macleay near the junction of the Macleay River and Georges Creek and marked by a rock (Creamer 1981). While its exact location is unknown, this site is believed to sit outside the Project area north of the proposed lower reservoir location. A white ochre quarry is located nearby and members of the tribes with inherited connection to the catfish would perform an increase ceremony, which included interactions with the ochre. The ochre site is not documented, and its location is uncertain. No consultation on the Project to date has identified the site, and it may therefore be outside of the Project area. The catfish are also said to have given the *Thunggutti* a dance (Creamer 1981). An increase site for turtle, Darwar or Ngah-Goy, is located at the river bend at Pee Dee.

In the region, ethnographic accounts most often describe male initiation ceremonies, while women’s ceremonies are rarely recorded (JS Heritage 2003). Male initiation ceremonies known as Murrawan, Dalghai, Keepara, and Burbung were performed in a number of locations around the Macleay Valley and surrounding tablelands (Kelly 1975; Enright 1937). It must be noted that significant changes to initiation ceremonies occurred from the 1880s (see Section 5.3.3i). The Carrai waterholes, located on the tablelands of Carrai National Park east of the confluence of Macleay River and Kunderang Brook, were an historical initiation place sacred to senior men of the *Thunggutti* and *Nganyaywana* (*Aniwan*) from around Armidale (Creamer 1974). The sites were forbidden to both young boys (guruman) and women (gulban); and even during the current ACHA process, personnel were not allowed to visit the site. The site is some 3.2 km south of the Project area. Other male initiation sites in the region include Burrel Bulai or Barralbarayi mountain (also known as Mount Sugarloaf and Mount Anderson), which was also a special place for Clever Men, Mill Hill, and the Nambucca River boundary between *Thunggutti* and *Gumbainggir* (Kelly 1989; DNAAG Aboriginal Art Gallery 2022; Creamer 1981; Knuckey 2016).

Initiation ceremonies or part thereof would also take place at bora grounds. Bora grounds usually consisted of a circular clearing defined by a raised earth circle, or circular stone arrangements. These areas were often associated with scarred or carved trees and linked to other sacred places by ancestral pathways (Kelly 1989; Creamer 1977). Of the total 19 'ceremony and dreaming' sites previously documented in proximity to the Project area, four include bora ceremonial rings (Section 6.4). Sacred stones were also used during the initiation ceremonies. Enright (1937) records that men initiated under Keepara used two of the stones represented the Creation story of the creation of the moon and the other a story relating to the brown snake men. A Burbung (male initiation) gathering including language groups from north, west, and south of the Macleay took place at bora ground "near Smoky Range" in 1898 (Creamer 1981; Macleay River Historical Society 2002). It is possible the bora grounds may have been used for other ceremonial activity including corroboree. Corroborees, were gatherings where dancing, singing and storytelling occurred took place well into the historical period, but few early records of such meetings survive from the Macleay River region (Creamer 1981; Harrison 2004).

Relating to ceremony, burial sites are not common throughout the Macleay River region, but examples are known. A pre-Contact burial was uncovered in the Oxley Wild Rivers National Park near Kunderang and a historical burial site of two Clever Men is located at Five Day Creek (NPWS 2008; Creamer 1981). It may be that Aboriginal people in the region primarily dealt with the dead via exposure or cremation. Nevertheless, once the spirit of a dead member of the *Thunggutti* was released from the body they would travel to the summit of Job's Mountain, approximately 14 km northwest of the Project area, and enter the world of the sky deity (Creamer 1981).

5.2.3 Tools, weapons and apparel

Pre-colonisation patterns of occupation in the Upper Macleay are not well documented (NPWS 2008). However, occupation around the Macleay River valley was influenced by the abundance of accessible resources, shelters, and water sources. Groups of the region travelled around the country throughout the year, moving to a new area when resources diminished, seasons changed, or if there was a death or ceremony to attend (Harrison 2004). It is generally believed that the Upper Macleay region was largely a temporary residence, with Aboriginal groups moving from the coastal hinterlands to the Tablelands for up to four months each summer and returning to the coast and warmer valleys during the winter (JS Heritage 2003; NPWS 2008). The route of the Georges Creek Fire Trail, between Georges Creek to Styx River Forest Way, is thought to follow the path of a traditional route between the Macleay River valley and tablelands (NPWS 2008).

Local resources were readily exploited, as demonstrated through the predominant utilisation of locally available quartz, chert, mudstone and volcanic lithic material in archaeological assemblages of the region (Davies et al 1993). Animals in the Upper Macleay area that were hunted by Aboriginal people included kangaroos and pademelons, possums, scrub birds and waterfowl, echidnas, eels, turtles, snakes, fish, grubs and native bees (Kelly 1989; Harrison 2004; see also Section 4.8). Tools utilised to hunt or capture game included woven nets of kurrajong (*Brachychiton populneus*) fibre as well as hunting and fishing spears, shields, boomerangs, clubs, and watercraft made from local timbers (Plate 5.2) (Kelly 1989; Harrison 2004). Many of these items were also used in combat.

An early surveyor for the region, Clement Hodgkinson, recorded hunting practices in their diaries. Observing a pademelon hunt around the Nambucca River Hodgkinson wrote:

As we entered the brush we heard the loud shouts of the blacks who were busily engaged in hunting. The plan adopted by the natives in this pursuit, was somewhat similar, on a small scale, to the mode of hunting pursued by some of the Indian princes. The [Aboriginal people] first of all dispersed and formed in the brush a circle of a quarter of a mile in diameter, and then, on a given signal, they all commenced shouting and advancing towards the centre, gradually lessening the circle. The brush kangaroos or pademellas were thus gradually enclosed, and driven into a small space, where, being surrounded on all sides, they were dispatched by the natives, who carried for this purpose short cylindrical pieces of wood, formed from a species of tree growing in the brushes, which is of greater specific gravity than any wood I am acquainted.

(Hodgkinson 1845 in Harrison 2004, p.94-95)

The flora of the Upper Macleay also provided food and material resources. Fruits, yams (towwack), roots, nuts, grass seeds, and cabbage tree palm tops were collected seasonally (Kelly 1989; Harrison 2004). Toolkits also included firesticks, digging sticks, dilly bags and coolamon for carrying water and food (Kelly 1989). Possum skin cloaks were used as protection from the elements, but little other clothing was worn prior to European contact (Kelly 1989). A possum skin cloak features in the portrait of “Keanni, Queen Macleay River Tribe” (Plate 5.3). Men were known to wear a “murrpin”, a woven belt around their waist and Hodgkinson’s illustrations also suggest certain men would wear elaborate headdresses (Plate 5.2 and Plate 5.4).

Objects made from organic material, as well as clothing items such as animal skin cloaks, rarely survive in the archaeological record. Material culture more likely to survive in the archaeological record are tools made from stone, which in the local area included axes, hatchets, hammer stones, grinding stones and dishes, scrapers, blades and other flaked tools.



Plate 5.2 Natives spearing fish on the Bellengen [ie Bellinger] River (also known as Fishing on the Macleay) by Clement Hodgkinson 1842. Source: National Library of Australia (NLA), call number PIC Volume 62 #U7568-U7570 NK2405

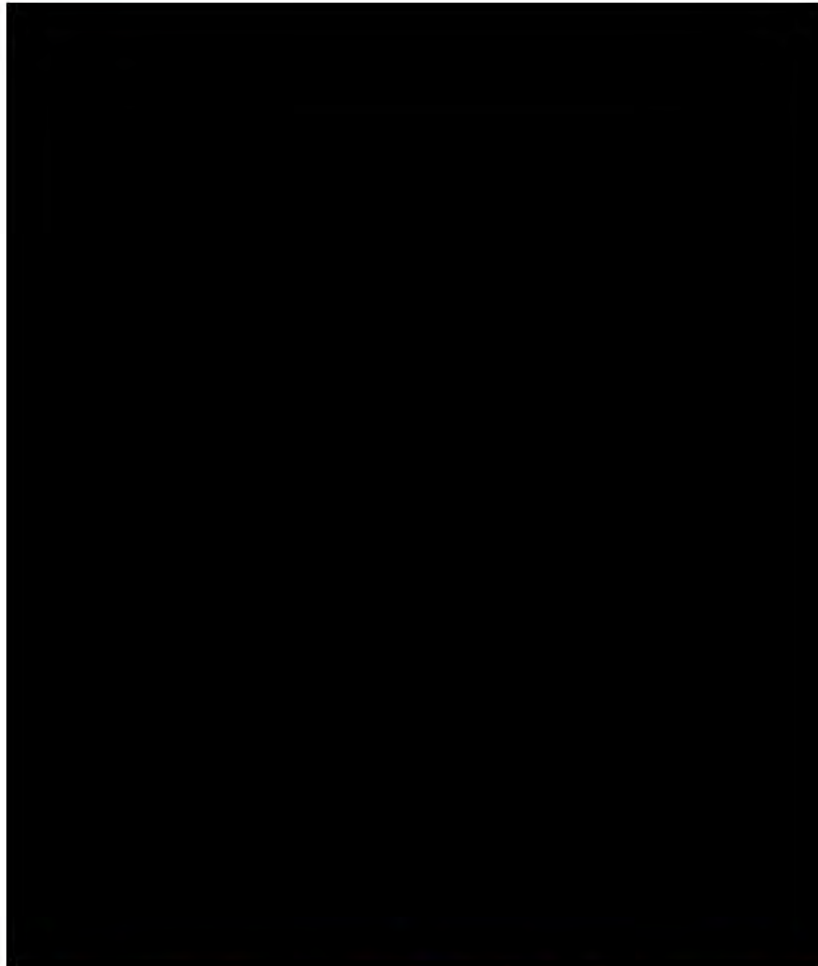


Plate 5.3 81-82. "Keanni", Queen Macleay River Tribe, N.S.W. in *Australian Aboriginals* photographed by Kerry & Co ca. 1892. Source: State Library of NSW, call number PX*D 398



Plate 5.4 A fight by Clement Hodgkinson c.1840s. Source: NLA, call number PIC Volume 62 #U7580 NK2405

5.3 Contact and post-Contact

The following sections are summaries extracted from EMM (2022a) and the cultural values mapping report (Appendix D).

5.3.1 Cedar getters and squatters

John Oxley's 1818 expedition into the interior of NSW brought the first European presence to the rugged landscape of the Upper Macleay, with the party coming to the plateau above the Kunderang ravines (NPWS 2005; Creamer 1977). Further explorations did not occur until 1826, when an Aboriginal man named Mooney brought news to Governor Macquarie of a "truly magnificent" river ~48 km north of the Port Macquarie, bordered by fertile plains approximately 64 km inland from its mouth (*The Sydney Gazette and New South Wales Advertiser* 20 May 1826). Captain Samuel Wright confirmed Mooney's account and in 1827 Captain A.C. Innes established a cedar party near Euroka, north of Kempsey (Macleay River Historical Society 2002; Creamer 1977; Neil 1972).

The hunger for cedar within the British colonies drove loggers to follow the "red gold" of the Macleay westwards from the late 1820s (Harrison 2004). Cedar cutting was so prolific during this period that within 10 years the Macleay River region became almost completely devoid of the timber (Harrison 2004). Conflicts ensued between the encroaching cutters and the local Aboriginal people but the non-permeance and nomadic lifestyle of cedar getters generally allowed traditional practises to continue (NPWS 2005; Harrison 2004).

The need for productive pastoral and farmland led to settlers claim land along the Macleay River from c. 1830, despite settlement north of Port Macquarie not sanctioned by the Government at the time (NPWS 2005). Cedar cutter Enoch William Rudder established the township of Kempsey in the early 1830s on the 812 acres (328.6 ha), he was later granted in 1835 (Harrison 2004; Macleay River Historical Society 2002). During 1836, the *Crown Lands Unauthorized Occupation Act* allowed the occupation of lands beyond the Government's limits of location and encouraged squatters to take up large runs along the Macleay River and its tributaries (State Archives and Records of NSW 2021; Harrison 2004; Blomfield 1981). Due to the inaccessibility of the landscape and unsuitability for sheep grazing meant development of pastoralism in the Upper Macleay was more gradual than surrounding areas with squatters only taking up land over the last years of the 1830s (Harrison 2004). Three squatting runs were established in and around the Project area prior to 1843 including *Cunderang* (later *Kunderang*) to the south, *Long Flat* to the north and *Towel Creek* (also *Towal Creek*) to the northeast (Plate 5.5; *New South Wales Government Gazette* 18 November 1845). At least one registered Aboriginal representative is aware of ancestors that worked on these stations in the 19th Century (Section 5.5).



Plate 5.5 Pastoral stations of the Upper Macleay c.1847. The approximate location of the Project area in red. Source: Harrison 2004

5.3.2 Frontier violence

The settlement of the Macleay River valley (or ‘Falls Country’ as the landscape came to be known) came at a time of unsympathetic Government policy regarding the rights of Aboriginal people (Harrison 2004). In 1824, Governor Brisbane declared martial law in response to increased frontier violence in Bathurst allowing squatters the right to defend their land claims by any means necessary. As a result, Aboriginal people ‘were shot like wild beasts’ (Price 1949 in Blomfield 1981). Two years later Governor Darling, who served between 1825 and 1831, “advised settlers to organise their own protection against Aboriginal resistance fighters defending their traditional lands” (Harrison 2004).

Frontier violence went relatively unchecked for many years. However, in 1838 a party of squatters and stockmen were brought to trial, found guilty and hung for the murder of at least 28 Aboriginal people at Myall Creek (National Museum of Australia 2022). The Myall Creek Massacre was the first instance where white settlers were punished for crimes against Aboriginal people to the full extent of British law. This event set a legal precedent against the killing of Aboriginal people, unfortunately massacres and killings continued, but often with increased secrecy, with many going unreported (Quinlan and Eckerman 1983).

The encroachment of Europeans into the rugged Upper Macleay region was not without conflict (Harrison 2004). As European squatters took claim over *Thunggutti* land, the local Aboriginal people were forcefully disconnected from their food and water sources, sacred places, travel routes, and other members of their community (JS Heritage 2003). The Kunderang run, specifically, bisected *Thunggutti* country, blocking access between the coast and the tablelands (Creamer 1977). The problematic encroachment of settlement on the Macleay River was concerning to some European observers. For example, in 1845 George James MacDonald reported:

Their [Aboriginal people of the Macleay River valley] means of subsistence must have diminished to a considerable extent; the introduction of five hundred thousand sheep into the original hunting grounds of the district, has nearly driven the kangaroo, on which the natives formerly subsided, beyond its boundaries.

(MacDonald 1845 in JS Heritage 2003)

Moreover, the Commissioner for Crown Lands estimated the population of Aboriginal people in the Macleay River valley had been reduced to 200 individuals by the mid-1840s (JS Heritage 2003).

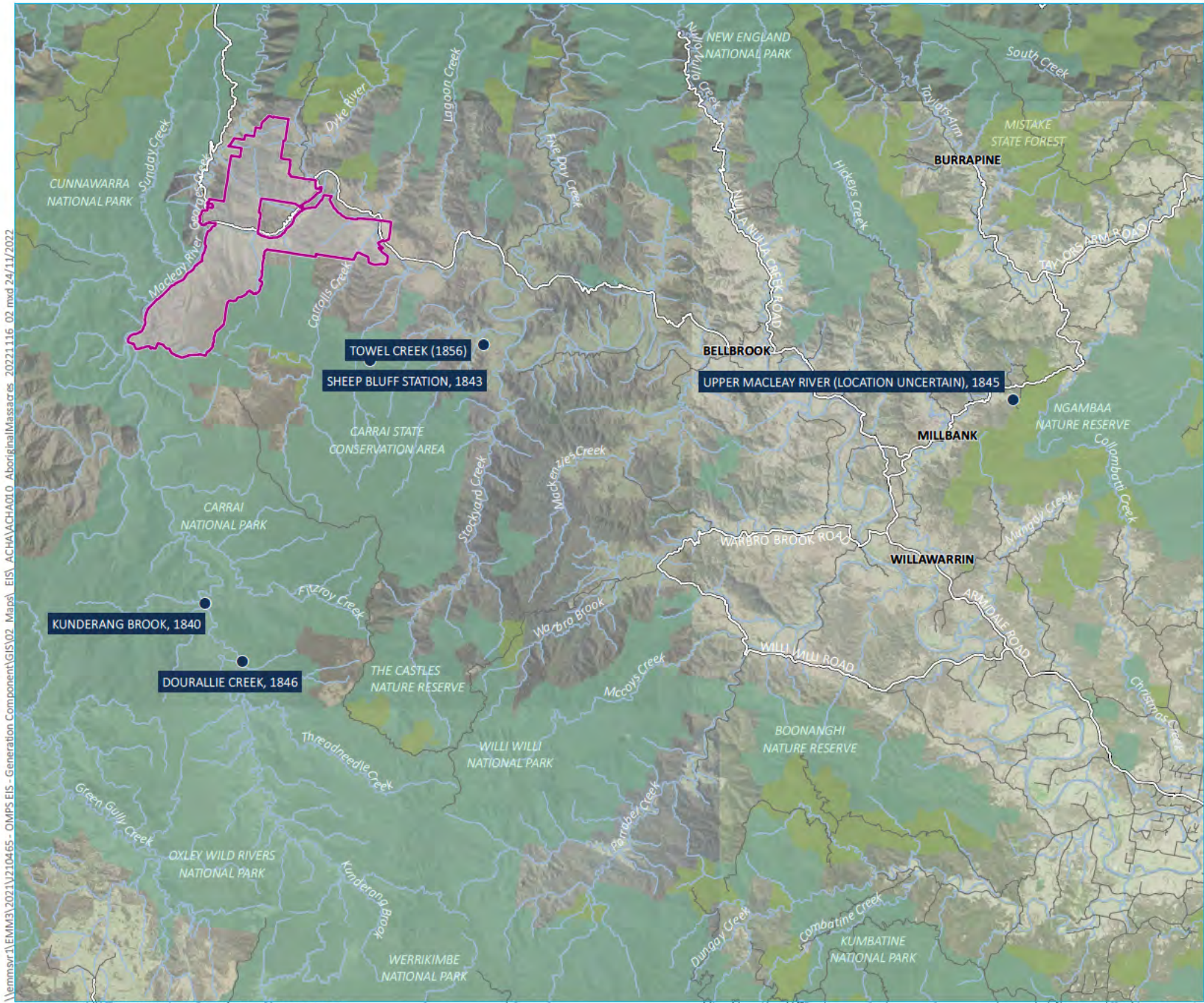
The pressures of dispossession resulted in a vicious cycle of sustained and hostile Aboriginal/settler violence between 1838 and the late 1850s (Harrison 2004). The *Thunggutti* of the Upper Macleay resisted the encroaching pastoralist through guerrilla-style tactics which included large-scale organised raids, systematically spearing, stealing livestock and attacking settlers (Harrison 2004). “Hit and run” style attacks on homesteads and livestock were a common form of resistance to colonial dispossession. The rugged landscape of the Upper Macleay provided a refuge for the local *Thunggutti* and refugees from the surrounding regions to retreat to following the raids (Harrison 2004; NPWS 2008). These refuges were centres of resistance in the changing landscape of the region. It is believed the Carrai Plateau, west of the Project area offered one such refuge (Morris 1989; NPWS 2008). Guerrilla attacks on properties around the Upper Macleay escalated over the 1840s (Campbell 1932). In 1848, “A McLeay River Squatter” complained in a letter to the editor that:

hardly a day passes but complaints are made of the spearing cattle on the runs; in fact, the [Aboriginal people] appear to have abandoned the pursuit of opossums and other small animals, and intend entirely to look to our herds for their support... These outrages are never the act of a solitary individual, but of the whole tribe acting in concert, and participating in the plunder.

(The Sydney Morning Herald 26 July 1848)

By 1849, the squatters had grown tired of the constant attacks and 29 of the 31 station holders on the Macleay River wrote to the Governor seeking protection (Campbell 1932). A bill was drafted to change the process of punishment for Aboriginal raiders, but it did not pass parliament (Campbell 1932). Thus, squatters could only legally “punish” identified perpetrators (*The Sydney Morning Herald 26 July 1848*).

Up to 30 massacres are known to have occurred through the Macleay River valley between 1838 and 1851. Five of these massacres occurred in the regional vicinity of the Project area (Figure 5.1) (The University of Newcastle 2019; Harrison 2004). The primary source for massacres during this period are typically contemporary newspapers, or frontier diaries. It must be noted that newspaper reports of the time focus on Aboriginal violence towards settlers and rarely report Aboriginal deaths. As such, the events of Aboriginal massacres are often recorded from recollections after the fact.



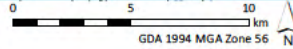
- Project area
- Aboriginal massacre site
- Named watercourse
- Major road
- Minor road
- Named waterbody
- NPWS reserve
- State forest

Aboriginal massacres documented near the Project area

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 5.1

\\lemmsvr1\EMM3\2021\210465 - OMPS EIS - Generation Component\GIS\02 Maps\ EIS\ ACHA\ACHA010 AboriginalMassacres 20221116 02.mxd 24/11/2022

Source: EMM (2022); DFSI (2020, 2021); GA (2011, 2020); ARC (2017)



i Kunderang Brook, Upper Macleay River Valley (May 1840)

In May 1840, between 24 to 36 Aboriginal men were killed near Kunderung Brook, south east of the Project area, in retaliation for stealing 370 sheep being herded by Sergeant Freer from New England to Messrs. Betts and Panton's run on the Macleay (Figure 5.1) (The University of Newcastle 2019; The Sydney Herald 1840). Additionally, Campbell (1932) believes the sheep were being taken to Long Flat—which passes into the Project area – however, Betts and Panton also had claimed the Wabbra station by the time of the incident (*New South Wales Government Gazette* 18 November 1845). A detailed narrative of the sheep theft was published in *The Sydney Herald* (10 July 1840). The article reports Freer's party:

... soon discovered that the sheep had been driven in the direction of the mountains by the [Aboriginal people]; after following the tracks about eight miles, they came to a precipitous rock, where they turned down to a creek, on the sides of which they discovered from two to three hundred [Aboriginal people] busily engaged in roasting not kangaroos, but mutton. The instant they perceived Mr. Freer and his party, they took to their spears and boomerangs, retiring to the ranges, but on discovering the weakness of pursuers, endeavoured to surround them, threatening and abusing them in tolerable English.

(*The Sydney Herald* 10 July 1840)

Freer retreated to the Pee Dee station where he recruited the help of three additional horsemen. With the assistance from an Aboriginal tracker known as Sandy, the party pursued the sheep rustlers through the Macleay Gorges proceeding “about twelve miles up Coonderang Creek [*sic*], when they again turned across the mountains, and passed down into another creek” where some of the sheep were recovered (*The Sydney Herald* 10 July 1840; Weingarth, 1921). The party is said to have travelled an additional 15 km before discovering the perpetrators encamped:

in the act of preparing mutton; on being fired upon they speedily decamped, and the pursuing party were rewarded for their praiseworthy conduct by the satisfaction they felt on recovering two hundred and twenty sheep alive.

(*The Sydney Herald* 10 July 1840)

The unnamed author of the article suggests the sheep theft was premeditated and organised by Aboriginal people friendly with the labourers on Bett's and Panton's run. Moreover, the author specifically omits reporting Aboriginal deaths to highlight their dissatisfaction with the results of the Myall Massacre going as far as to state:

Justice, nay humanity itself, (when we look to the future) would have warranted Mr. Freer's taking ample vengeance, and teaching the [Aboriginal people] a lesson they would not readily have forgotten... [Freer] wisely restrained his men...but had Mr Freer and his party inflicted summary vengeance on these robbers there would have been double the reward offered for ... their apprehension and in all human probability they would have been tried for their lives.

(*The Sydney Herald* 10 July 1840)

Later retellings of the Kunderang Brook massacre indicate that Aboriginal people were killed by Freer's party. In 1851 John Henderson recalled “two or three dozen men were slaughtered” and in her reminiscences Annie Baxter also states, “there was a terrible encounter- and some of the unfortunate creatures killed” (Harrison 2004). The massacre took place on land which would become the Cunderang run (later Kunderang) but this area of the Upper Macleay had not been claimed at the time of the massacre (Figure 5.1) (Harrison 2004).

ii Sheep Station Bluff, Upper McLeay River, 1843

In June of 1843, three stockmen working on the outstations of Betts and Panton were killed and at least two others injured in individual attacks (*The Sydney Morning Herald*, 12 June 1843; 20 June 1843b). Further, “a great number” of Betts and Panton’s sheep were taken with 17 found roasting in stone camp ovens (*SMH*, 12 June 1843). The perpetrators were pursued by Commissioner Massie through the Mounted Police, resulting in three Aboriginal men, one of whom was known as “Fowler”, placed in custody (*SMH*, 12 June 1843). One newspaper report also states that three Aboriginal men were shot during the arrests, these deaths are not recorded on the *Colonial Frontier Massacres in Australia, 1788-1930* database (*SMH*, 12 June 1843).

The second recorded massacre occurred in 1843 when a group of Aboriginal people were driven off a precipice at Sheep Station Bluff after stealing a cow (Figure 5.1) (The University of Newcastle 2019). Bloomfield (1981) recounts the narrative, which maintains that two boys were left to guard a small herd of cattle at Sheep Station Creek while their superiors went looking for wild cattle. The boys fell asleep and awoke to a group of Aboriginal men stealing a young cow that had been speared. The superiors returned to camp and the boys told them what had occurred. The men set off in pursuit eventually forcing the Aboriginal people over a cliff.

The station head returned to the massacre site the following day to ensure all were dead. An infant was found among the bodies and was taken to the McMaugh’s at Pee Dee Station. It is likely the Aboriginal child was taken to Pee Dee as it was one of the few stations of the region that was owner-occupied prior to the 1880s (Harrison, 2004). It is said the child was later taken to live with Thompson family at Towel Creek, east of the Project area, and became known as Tillie Thompson (Figure 5.1) (Blomfield 1981).

iii Unknown location, Upper Macleay River, 1845

In 1845 a “great number” of Aboriginal people were killed as retaliation for the murder of two *Cunderang* shepherds and their wives along with the theft of 800 sheep (Figure 5.1) (Harrison, 2004; The University of Newcastle 2019). In 1845, Cunderang was primarily a heifer station even though more sheep than cattle were present on the run (Harrison, 2004). The daily running of the property was left to overseer superintendent, J. Shufflebottom, as landholder George Jobling Esq remained in residence in Port Macquarie (Harrison, 2004; Museum of Applied Arts and Sciences, 2021). In 1843, Cunderang recorded six residents, primarily shepherds and their families (Harrison, 2004). The property had no home station, and the only structures present in 1845 were an unknown number of bark shepherd’s huts and stockyards. It is believed two of the huts may have been situated in the location of the late nineteenth century Kunderang East and West homesteads (Harrison, 2004).

The events of the 1845 massacre feature in a regional history written by Mrs H.A McMaugh, the daughter in law of Caroline McMaugh who resided at Pee Dee Station from c. 1845 (Harrison 2004; Weingarth 1921). After the discovery of the bodies and the missing sheep, Commissioner Massie, John McMaugh and a party of men from the local stations tracked the sheep to an Aboriginal camp under a cliff “and a great number of the [Aboriginal people] were killed” (Harrison, 2004). The location of the killings is not specified in the narrative and appears to be mapped in a generic location on the *Colonial Frontier Massacres in Australia, 1788-1930* database (Figure 5.1).

iv Dourallie Creek, Upper Macleay River Valley, 1846

In October 1846, two squatters opened fire on a camp near Dourallie Creek killing a substantial number of the group (Figure 5.1) (The University of Newcastle 2019). The details of the massacre were recounted to Bloomfield (1981) by Aboriginal Elder Victor Shepherd. Shepherd recalled that two squatters on horseback attacked an Aboriginal camp in retaliation for stealing sheep. The men shot the entire camp numbering 60 men, women and children who were swimming in Dourallie Creek.

v Towel Creek, Clarence PD, 1856

The final documented massacre occurred in 1856 when a group was killed near Jimmy Taylor's gully, Towel Creek, by settlers who were scouting for Aboriginal people, probably for livestock stealing (Figure 5.1) (The University of Newcastle 2019). Towel Creek (originally, Towal Creek) is located east of the Project area.

At the time of the massacre, Towel Creek was owned by John Warne and functioned primarily as a cattle station (*Empire*, 1862; Morris, 1989; *New South Wales Government Gazette*, 1848). The account of the Towel Creek massacre was also recounted by Victor Shepherd, who himself was told of the event by Elder tribesman Stanley Murray (The University of Newcastle 2019).

Two settlers are said to have been scouting the upper reaches of Towel Creek looking for Aboriginal people. The reason for the hunt is not stated. Jimmy Taylor, an Aboriginal servant with the party, warned the camp ahead of the settlers. The camp moved upstream and some of the group hid in the rainforest, while others continued to the Tablelands. It is said a cough gave away the hiding location of those who stayed in the rainforest and the settlers opened fire. One victim of the massacre was named as Jack Scott's mother.

vi The late 19th Century

Violence in the region was greatly reduced after the establishment of the Native Police Force at Nulla Nulla Creek in 1851 (Harrison 2004). These native police force units were comprised of Aboriginal troopers under the command of a (usually white) officer and aided in police investigations, especially through their bush and tracking knowledge. Aboriginal men were often deployed away from their traditional lands. The police presence in the region also contributed to dispossession (McDonald 1996). For example, in 1860, the Mounted Police drove groups of Aboriginal people from the Macleay River to the New England Tablelands, causing tension between the language groups (McDonald 1996).

As time went on the relationship between the Aboriginal groups and European settlers in the New England Tablelands remained complex. Local Aboriginal groups had been pushed to the peripheries of the stations. The 25 squatting runs on the Macleay River covered 170,000 ha and forced local Aboriginal groups to the peripheries of the stations (Morris 1989; Creamer 1977). However, labour shortages driven the 1850s gold rush allowed Aboriginal people back onto their traditional lands as labourers on stations throughout NSW in the latter half of the nineteenth century (Harrison 2004). In slow times Aboriginal station workers practiced traditional food gathering activities and spiritual traditions (Collaborative Solutions 2002).

Employment records from stations on the Upper Macleay, however, indicate white labour may not have been as scarce as in other regions with Aboriginal labour sought only occasionally prior to the shifts in land tenure practices in the last two decades of the nineteenth century (Harrison 2004; NPWS 2008). "The Germans", who inhabited land near Bellbrook in the 1870s, however, were known to regularly employ Aboriginal people during their tenure (Quinlan and Eckerman 1983). As the Upper Macleay stations shifted from absentee landlords to owner-occupied from the 1880s, Aboriginal people began to be more readily employed on the stations as farm labourers, stockmen, domestic servants, and health carers (Harrison 2004; NPWS 2008).

The dairy boom and construction of a butter factory at Torrokka in 1906 restructured pastoral labour around the Macleay, which in combination with the establishment of Aboriginal Reserves around the tributaries of the Upper Macleay led to a high rate of Aboriginal pastoral employment into the twentieth century (Macleay River Historical Society 2002).

5.3.3 Aboriginal Reserves and camps

In 1880, the NSW legislative council formed the New South Wales Aborigines Protection Association and appointed George Thornton as the *Protector of Aborigines in New South Wales* (Rutledge 1976). The Association aimed to “protect” Aboriginal people from white society through control. It was later subsumed by the Aboriginal Protection Board, established in 1883 (Rich 1990). The Board held no statutory power but employed a system of “protection-segregation” to control the lives of Aboriginal people in New South Wales (Rich 1990; NSW State Archives and Records 2010). The Board made recommendations concerning the welfare of Aboriginal people, including approving the removal of children, and, with the assistance of the police established and managed Aboriginal Reserves in New South Wales (Rich 1990; Quinlan and Eckerman 1983). Other responsibilities of the Board included organising housing, and issuing blankets, clothing and ration coupons (NSW State Archives and Records 2010).

At the time the establishment of the Board, the Aboriginal population of New South Wales was concentrated in rural areas; however, as large pastoral properties were subdivided, government resettlement schemes encouraged Aboriginal people to move from stations and towns to camps and reserves (Giggs, Greenwood and Lea 1977; Hall 1977; Moran 2004). Between 1883 and 1971, 126 reserves were established in northeast New South Wales, the majority of which were within the Clarence and Macleay valleys (Rich 1990). The government had a paternalistic presence on *Nganyaywana (Anaiwan)* Country prior to the establishment of the board, distributing blankets in the New England region from the 1820s (NSW State Archives and Records 2022). However, JS Heritage (2003) argues that the Aboriginal people of the Upper Macleay retained at least some economic and social autonomy prior to the introduction of the reserve system.

Sixteen Aboriginal Reserves were established through the Macleay and Bellinger River valleys between 1883 and 1908, as well as a number of Aboriginal camps (Harrison 2004). Of these, Bellbrook Reserve (AR 49,982), and camps at Lower Creek/Long Flat and George’s Creek, are in close proximity to the Project area (Figure 5.2). The families from these three locations developed a reciprocal relationship with the station holders around the Upper Macleay. Aboriginal men and their families received payment, rations and supplies from the landholders in exchange for a stable, highly skilled and valued labour source (Harrison 2004; NPWS 2008). The seasonal work of the stations allowed families to live in a semi traditional fashion including working together as families on stations and supplementing bush foods with rations (Harrison 2004). Aboriginal people drawn from the three locations were the primary employees on Kunderang Station from the First World War until the 1960s.

A desire for independence among the Aboriginal people, including those on the Macleay River, rose to prominence in the 1920s (Maynard 2005). “Delegates from Bowraville, Nambueca [*sic*]and Kempsey spoke, while Bellbrook, Nana Glen and Lower Creek were represented” at meetings of The Australian Aboriginal Progressive Association held at Kempsey in 1925 (*Macleay Argus* 9 October 1925). The Australian Aboriginal Progressive Association (AAPA) was established by Worimi man Fred Maynard in 1924 in response to the misdeeds of the NSW Aborigines Protection Board and revocation of reserve lands after the first World War (Maynard 2003, 2005). The AAPA aimed to:

- reclaim land for every Aboriginal family in the country
- stop the Protection Board’s removal of Aboriginal children
- gain Aboriginal citizenship
- protect Aboriginal cultures and identities
- have the Federal government conduct a Royal Commission on Aboriginal Affairs with the end goal of replacing State run Protection boards with a Federal all Aboriginal committee.

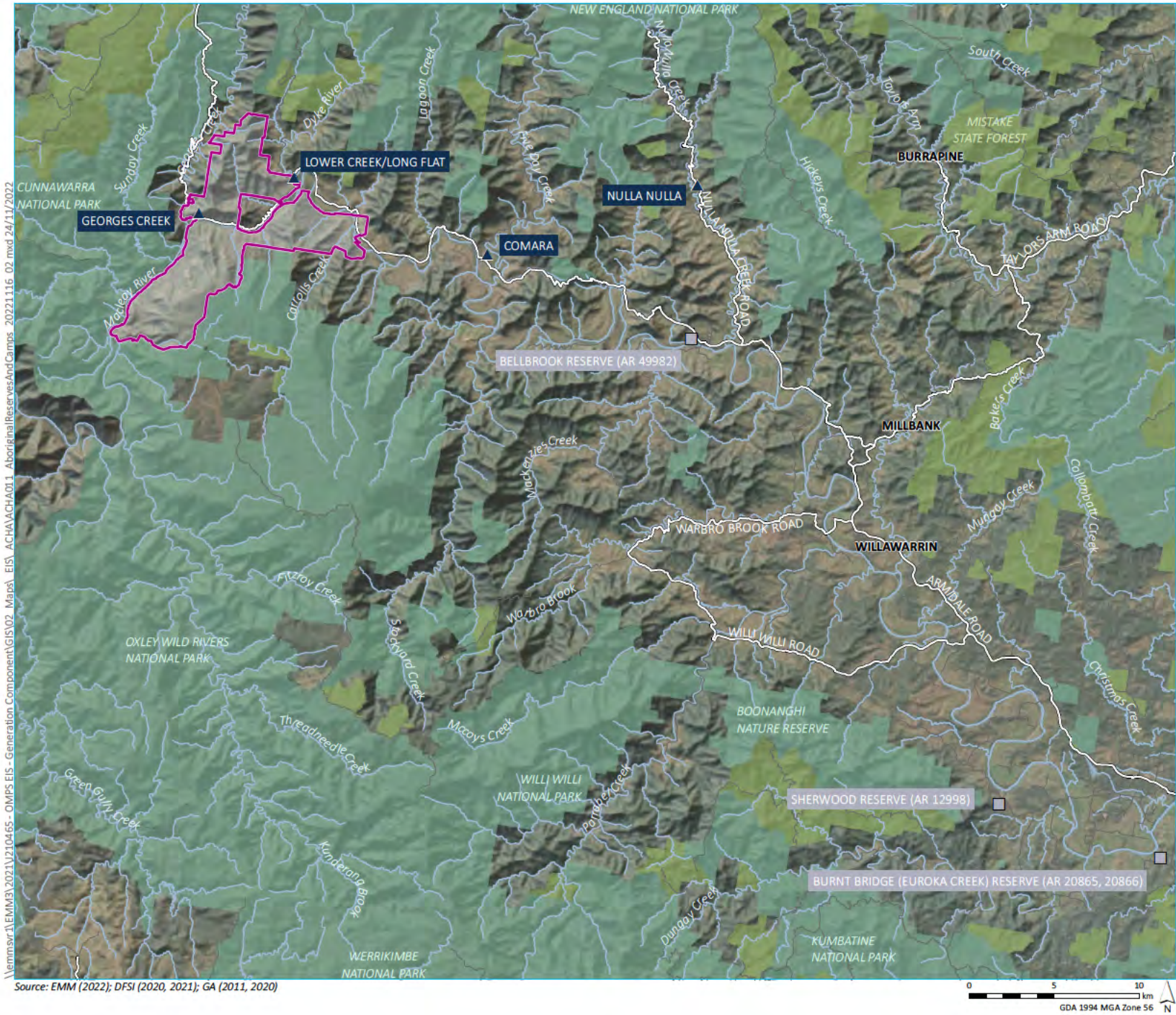
Maynard toured the Macleay region in 1927 and found:

60 natives, men, women, and children, suffering from starvation. The conditions were most horrible. The public did not learn about it because there was a "hush" policy... Mr. Maynard said that help from the police was not sought, as it was feared that the children would be taken away from the parents. That was considered crueller than starvation.

(SMH 15 November 1927)

In reply, the Government medical officer for the Macleay region, Dr. J. B. McElhone, replied that no Aboriginal person had been treated for starvation, therefore, he believed "there is no truth in Mr. Maynard 's assertion" (*Macleay Argus* 18 November 1927). The AAPA was abandoned after 1927 due to the effects of the Great Depression and police intimidation encouraged by the Protection Board (Maynard 2005).

The Aboriginal Protection Board was reframed as the Aborigines Welfare Board under the *Aborigines Protection (Amendment) Act* of 1940 (NSW State Archives and Records 2010). Despite the Welfare Board's shift to "protectionist" policies, the experiences of residents of Aboriginal Reserves changed little over the following decades (Quinlan and Eckerman 1983). The Welfare Board was disbanded in 1969 and replaced by various services including the Aborigines Welfare Directorate and department of Social and Child Welfare (NSW State Archives and Records 2010).



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Source: EMM (2022); DFSI (2020, 2021); GA (2011, 2020)

Aboriginal reserves and camps of the late 19th Century in proximity to the Project area

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 5.2



i Bellbrook Reserve (AR 49,982)

Bellbrook Reserve was established on Nulla Nulla Creek in 1884 after local *Thunggutti* people demanded they be granted land to establish their own farms (Quinlan and Eckerman 1983). By 1885, ten families had settled on the reserve constructing huts and working the land while continuing to practice traditional lifeways within and in the vicinity of the Reserve (Morris 1989). Bellbrook became an example of successful unsupervised Aboriginal “assimilation” and self-sufficiency in the region (Morris 1989). A school for Aboriginal children was established on Bellbrook in 1903 increasing the Government’s presence the Reserve (Quinlan and Eckerman 1983).

As life became focused on the Reserve there was a notable shift in the location of ceremony. For example, in the 1920s initiations moved from Pitroy to Middle Creek (Creamer 1981). The change in location was due to multiple factors including distance, loss of bush food knowledge, and work schedules. The sacred stones that were held at the Pitroy site were transferred to Middle Creek, then later to Bellbrook where they were buried at Long Gully (Creamer 1981). Twentieth century initiation ceremonies represent the importance of the continuity and evolution of traditions for the people of Bellbrook.

Government control of Aboriginal people increased in the 1930s as a result of the economic pressures of the Great Depression (Creamer 1977). The Aborigines Protection Board took institutional control of the Bellbrook Reserve, self-managed farms were shut down, a Government appointed white manager was stationed at the Reserve, and a Government store established (Harrison 2004; Creamer 1977). The site became a place of surveillance and the residents of Bellbrook struggled against the constant interference with their lives and livelihoods (Quinlan and Eckerman 1983; Kelly in Creamer 1975). This increased control also led to changes in ceremonies between 1931 and 1935 (Creamer 1977). Tangentially, the final initiation ceremony for members of Bellbrook occurred in 1935. Creamer (1977) describes the initiation beginning with a ceremony and camping at Yittinge Creek before the initiates travelled along an ancestral pathway back to the Reserve. Given the sensitivity, the specific activities will not be elaborated in this report, but references to locations at Gad’s Mountain and Long Gully formed part of these events. In 1938 the Aboriginal Protection Board attempted to close Bellbrook, but local landholders objected to losing their workforce and the Reserve remained open (JS Heritage 2003).

ii Lower Creek/Long Flat camp

A post-Contact camp was established at Lower Creek on the south bank of the Dyke River within the boundaries of Long Flat Station by local *Thunggutti* people (Figure 5.2) (Morris 1989).

There is little information about the camp at Lower Creek in the historical records. It is known members of the Cohen family resided on Lower Creek in the twentieth century (Harrison 2004). Bill Cohen began working at Kunderang Station on a temporary basis in the early 1900s before rising to head stockman, a role which allowed him to travel and live on country (Harrison 2004).

iii George’s Creek camp and Kunderang Station

A camp at George’s Creek was established north of George’s Creek junction within the boundaries of Long Flat Station around 1900 (Harrison 2004). The families residing at this location were *Gumbainggir* people from Grafton, including the Duroux and Hilton families, and provided the main source of labour for Kunderang Station (Morris 1989; Harrison 2004). Families lived in bark huts on the banks of the creek, hunted traditional foods and grew citrus trees, vegetables and corn (Morris 1989). During the working season families travelled south, along traditional pathways on the banks of the Macleay River, to Kunderang Station (Harrison 2004). The *Thunggutti* from Bellbrook Reserve would join the George’s Creek residents on Kunderang at weaner muster and branding seasons (JS Heritage 2003). A hut on the banks of Yard Creek was known to have been used by Aboriginal workers on Kunderang (Knuckey 2016).

In the 1930s George's Creek school was closed and the families with children had to relocate to Bellbrook (Morris 1989). George's Creek then became a "holiday camp" and home base with women and children coming to the camp during school holidays to take up their place in the family labour force (Harrison 2004). George's Creek became a significant part of the social landscape for the local Aboriginal people of the Upper Macleay, allowing families to reunite and live away from the surveillance of Bellbrook (Harrison 2004). Mustering and travelling routes employed by Aboriginal labourers during their work on Kunderang station pass through the Project area (Plate 5.6). The route represents a significant part of the cultural landscape biographies of the Aboriginal women connected to Kunderang (Harrison 2004). Changes to farming practices and increasing government restrictions on the lives of Aboriginal people disrupted the cycle of Aboriginal labour, especially women's labour, on Kunderang by the 1970s (JS Heritage 2003; Harrison 2004).



Plate 5.6 Walking and riding routes used by Aboriginal women travelling from George's Creek Reserve to Kunderang Station. The Project area encompasses the areas east of the Macleay River presented here. Source: Harrison 2004, p.125

5.3.4 Contemporary connections

Changes in the economic management of pastoral stations around the Upper Macleay from the 1960s reduced the need for Aboriginal labour in the region (JS Heritage 2003). As a result, the Aboriginal residents of the Macleay River Reserves were forced to look for work off Country. By the late 1970s, *Thunggutti* Elders were feeling the loss of their culture and had concerns about the future of their people (Kelly 1975; Ray Kelly in Creamer 1975). Even so, the creation of a Bora ground at Pee Dee in 1977 suggests a continuous connection with Country and traditions (Creamer 1981).

The detrimental effect of European settlement on traditional lifestyles cannot be overstated. Nevertheless, today, the contemporary *Thunggutti* people maintain their cultural links to their Country, family and aspects of traditional life. They fulfil their cultural responsibilities to care for country and for their cultural heritage places around the Macleay River Valley.

5.4 Cultural mapping

5.4.1 Rationale and Methods

Cultural mapping is described more fully as cultural resource mapping or cultural landscape mapping, and it refers to an eclectic range of research techniques and scholarly tools that are employed to ‘map’ the tangible and intangible cultural assets of people within the local landscape. It involves the application of a wide variety of techniques and activities, from community-based participatory data collection and management to the use of sophisticated mapping based on Geographic Information Systems (GIS), in order to come to terms with cultural resources for communities and places. Proponents of cultural mapping as cultural inquiry have claimed that:

From this perspective, cultural mapping is regarded as a systematic tool to involve communities in the identification and recording of local cultural assets, with the implication that this knowledge will then be used to inform collective strategies, planning processes, or other initiatives. These assets are both tangible, or quantitative (eg, physical spaces, cultural organizations, public forms of promotion and self-representation, public art, cultural industries, natural and cultural heritage, architecture, people, artifacts, and other material resources) and intangible, or qualitative (eg, values and norms, beliefs and philosophies, language, community narratives, histories and memories, relationships, rituals, traditions, identities, and shared sense of place). Together, these assets help define communities (and help communities define themselves) in terms of cultural identity, vitality, sense of place, and quality of life.

(Duxbury et al. 2015)

To apply these concepts and further understand traditional and contemporary cultural values associated with the area as a whole (including the Project area) cultural mapping was undertaken by Dr Philip Clarke, a highly experienced anthropologist, with the participation of key knowledge holders and/or elders (Appendix D). At least fifteen Thunggutti Elders were identified as the knowledge-holders during the consultation process when the cultural mapping was being discussed and organised. The interviews and fieldwork for this activity was undertaken between June and September 2022.

A detailed report of the cultural mapping and Dr. Clarke’s original field notes are included in Appendix D. The report includes a brief review of existing anthropological and ethnobotanical data for the region with which to compare provided oral histories; and the findings of a number of interviews with the key knowledge holders identifying sites, locations and values across the Project area and surrounds. The method undertaken in the current cultural mapping exercise was to record all places that the Aboriginal participants have declared to have some significance to them, and to determine whether there exists any sense of spatial boundaries. Through documenting the proposed sites an attempt would be made to determine the extent to which the stated importance is based on existing experience and knowledge of the Aboriginal informant, and to ascertain whether this is likely to be a shared opinion with other Aboriginal participants. The cultural mapping determined three types of classification for recording purposes:

- Cultural sites that can reasonably be assumed to have been in existence when Europeans first arrived in the region, or at least shortly afterwards when Aboriginal people were still living in a traditional foraging lifestyle (e.g. specific bora grounds, scarred trees, etc).
- Historical sites and places that typically reflect early interactions (or beyond living memory) between Aboriginal people and Europeans, such as episodes of frontier violence, working on pastoral stations, etc.
- Social history places associated with the contemporary local Aboriginal community (e.g. former Aboriginal house sites, gazetted cemeteries and schools). The documentation of these places helps to build a narrative that explains the experiences that members of local Aboriginal communities have had growing up on Country.

5.4.2 Findings

The cultural mapping reviewed provided the following summary:

- At the time of European settlement, the country in which the Project area is located was occupied by people known collectively as the Thunggutti, who all spoke a related language and shared many cultural attributes, and their descendants today are still based in the Macleay Valley.
- At the time of European settlement, the Project area would have been part of one or more estates associated with clans as landowning groups within the Thunggutti, although there is no information available on their clan identity.
- Upon the breakdown of the clan system in the late-19th century, due to the impact of European settlement, Aboriginal people in the Macleay Valley lived in settlement and large pastoral properties, where they maintained an identity as Thunggutti people.
- The main mythologies documented for the Project area were dominated by supreme beings, such as Baiame, Daramulan and Muni Burrebean, with totemic ancestors being of lesser importance in the records.
- The main ceremonial cycles, or Boras, in the region were the Burbung and Keepara, and the last of these was held in 1935 near the Bellbrook Reserve, although Aboriginal memories of them were recorded by anthropologists from surviving participants during the 1960s and 1970s.
- Analysis of records pertaining to Thunggutti mythology does not indicate that the Project area had any special cultural significance, with the nearest place of such high heritage value being the Carrai Waterholes to the south.
- The Thunggutti people of the Macleay Valley were centrally involved in what has been termed the 'Frontier Wars', but none of the documented events are directly associated with the Project area (Section 5.3.2).
- Graphic and historical records relating to the Thunggutti are extensive, and, while they are incomplete, it can reasonably be expected that any highly significant cultural heritage concerning the Project area would have been mentioned in them if it had existed.
- There are no cultural values recorded for the Project area in the early ethnography.

The mapping of Thunggutti Country from the point of view of contemporary Thunggutti community members has highlighted the places that they consider to be of primary importance in preserving their heritage. Twelve key places are listed, and all of these have high cultural significance (Table 5.1; Figure 5.3). The cultural places include those where Creation stories took place, Bora ceremonies were held, and more recently where archaeological evidence of past Aboriginal land use has been located. The historical places are represented by massacre and ration depot sites, and these are well documented by academic historians. Contemporary places are those associated with the residential and recreational spaces for Thunggutti families, such as Aboriginal reserves and camps. Pastoral stations where it is known that family members had worked in the past still have contemporary significance.

Of the twelve key heritage places and areas listed in this report, none will be directly impacted by the Project, and only three (Kunderang Station, George's Creek Camp, and Lower Creek/Long Flat Station [OMPS-CS3 – 5 inclusive]) will potentially be indirectly affected. At least one of these, Kunderang Station, has been subject to broader visual impact considerations as part of the EIS, and shown to have minimal impacts, but has not been specifically discussed with the local Aboriginal community. The results of the cultural mapping suggest that the most detailed extant knowledge is associated with the Country to the east of the Project area in the vicinity of the Bellbrook Reserve – a current centre of the local Aboriginal community. Contemporary Thunggutti understandings of massacres involving their ancestors is derived from oral history sources but is also heavily influenced by the published work of historians, such as Geoffrey Blomfield. The extent of contemporary knowledge of other heritage places, such as those upstream from the Bellbrook Reserve and in closer proximity to the Project area, was found to be much more generalised.

In relation to cultural flows, the riverine landscape dominates modern Thunggutti cultural identity. The cultural landscape of the Macleay Valley is perceived by the contemporary Thunggutti as a living entity. When speaking about the importance of its major features, such as Nulla Nulla Creek, Macleay River and Sugarloaf Mountain, one of the Elders summed it up as:

We [Thunggutti] are nothing without them. Source of life – landmarks, like the [Sugarloaf] Mountain. Story on its own. River flows – like a spirit flowing through you Provides food from somewhere special – where you live. Generational food. The [Sugarloaf] Mountain draws you home. When Thunggutti people are off Country, they ask “What’s the river like?”

Several of the Thunggutti people interviewed were worried about the potential impact the Project would have upon the flora and fauna of the Macleay Valley. The contemporary Thunggutti people consider the maintenance of river and creek flows in the Macleay Valley to be crucial for them. In relation to the Macleay River, they state that it must continue to flow for the benefit of the physical environment, as well as for both their spiritual and physical health. The river is central to their Aboriginal identity, as it is perceived by modern Thunggutti people, including by those who may for various reasons live off-Country. For them, foraging in the upper reaches of the Macleay Valley is a central activity providing food, recreation and spiritual sustenance.

Key future requirements that have informed the results and recommendations of the ACHA report include:

- Members of the contemporary Thunggutti community require assurance that animal and plant species in the Macleay Basin will not be affected by the Project, in order to maintain their riverine foraging practices, which are a key element to their local identity.
- More generally, Thunggutti people want to see the local environment being protected. This is because they still believe that the local demise of totemic species may have a deleterious impact upon the general health of their community. It is part of Thunggutti oral history that their ancestors conducted rituals at key places in order to maintain populations of economically important animals, such as kangaroos, turtles, fish and eels.
- Establishing access for Thunggutti people who desire to visit key places within the Project area is considered important by community members, in order for them to continue their fishing practices, gather wild bushfoods and medicines, and to more generally look after their heritage.

- Neither of the three sites that may be affected by the Project area, George's Creek camp, Lower Creek/Long Flat Station or Kunderang Station (OMPS-CS3 – 5 inclusive), were discussed as to whether indirect or visual changes to the landscape were considered an impact by the Aboriginal participants.² Further discussion on this specific aspect is needed to further refine the impact of the Project to the sites.

² Note that a formal Landscape visual impact assessment was undertaken by EMM as part of the EIS and did not identify any visual impacts to Kunderang Station homestead. However, it is unclear from the discussions to date whether the cultural values of Kunderang Station related solely to the homestead or other parts of the property. Therefore it has been included here for further investigation during subsequent stages of the project.

Table 5.1 Aboriginal sites and places identified through cultural mapping

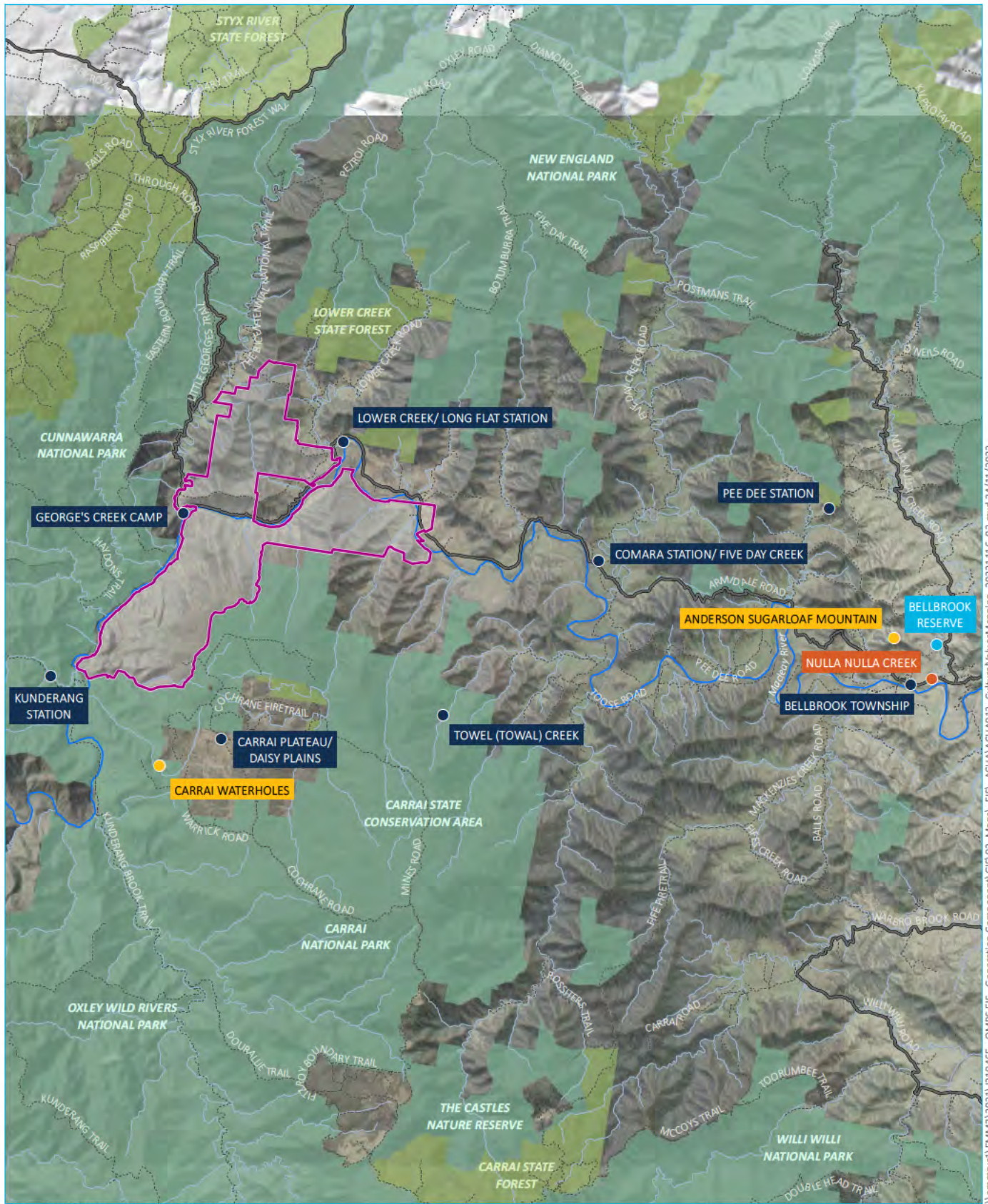
Site Name	Site ID	Description	Cultural values and reasoning	Site category	Impact
Carrai Waterholes	AHIMS 21-5-0005/ OMPS-CS1	A series of water-holes on Carrai Creek outside the Project area associated with gender specific (male) initiation activities. This site was not extensively discussed during the interviews but has been documented by an anthropologist previously. It remains a significant site in the contemporary community, with no one allowed to visit the site during the ACHA process.	Cultural, because of its primary association with Thunggutti initiations and ‘men’s business’ in general.	Cultural	None
Carrai Plateau/Daisy Plains	OMPS-CS2	A generalised location – a current small township and surrounds southeast of the Project area – that was identified due to the historical involvement of Aboriginal people in the cedar industry in this locale in the post-Contact period. It continues to have importance to several of the participants interviewed.	Historical, through the involvement of Thunggutti people working there. Contemporary, through the recognition of specific family associations with the area.	Historical/social history place	None
Kunderang Station	OMPS-CS3	A large pastoral station situated west of the Project area. Many of the discussions focussed on the current homestead and environs situated on the banks of the Macleay River. The importance of the site relates to both the historical frontier violence that occurred at Kunderang Brook (Section 5.3.2); and being a station on which a number of Thunggutti people worked in the post-Contact period.	Historical, through the history of frontier conflict and pastoral stations. Contemporary, through ancestors of Thunggutti people known to have worked there.	Historical/social history place	Potential (indirect)

Table 5.1 Aboriginal sites and places identified through cultural mapping

Site Name	Site ID	Description	Cultural values and reasoning	Site category	Impact
George's Creek Camp	OMPS-CS4	A generalised location outside the Project area focussed on the modern-day George's Junction campground. Historically an important camp for both initiation activities and broader regional gatherings of Aboriginal people. The exact location of the camp is poorly defined, but the characteristics of the locale would suggest the site was situated on the western bank between the Macleay River and the Armidale-Kempsey Road, which is a large flat terrace. Other parts of the confluence consist of moderate or steep relief and would be less suitable for the activities documented at the site.	Cultural, through the holding of Bora ceremonies there and a Catfish increase site. Historical, with mixed colonial history.	Cultural/social history place	Potential (indirect)
Lower Creek/Long Flat Station	OMPS-CS5	A location on the southern bank of the Dyke River near where it meets the Macleay River, upon which significant number of Aboriginal people gathered and camped in the past, both pre- and post-Contact; and located immediately north of the Project area. There is also documentation of initiation activities and at least one burial in the general locale, and references to similar activities in parts of Long Flat Station that is situated near Lower Creek.	Cultural, because of the presence of a Bora ground. Historical, through being a major camping area.	Cultural/social history place	Potential (indirect)
Comara Station/Five Day Creek	OMPS-CS6	The Five Day Creek corridor that runs through Comara Creek, east of the Project area. Interviews indicated that near this creek were rockshelters containing art; of two individuals that were murdered and buried in the locale in the post-Contact era; and of family ancestors that worked on the station in the recent past.	Cultural, due to paintings in caves. Historical, because of the killings and burials that took place there. Contemporary, through the association with a particular family and its place in ghost folklore.	Cultural/historical/social history place	None
Towel (Towal) Creek	OMPS-CS7	This site was identified based on a massacre, which many of the interviewees knew of, and which is outlined in Section 5.3.2.	Historical, through its association with frontier conflict.	Historical	None

Table 5.1 Aboriginal sites and places identified through cultural mapping

Site Name	Site ID	Description	Cultural values and reasoning	Site category	Impact
Pee Dee Station	OMPS-CS8	A historical station, east of the Project area, which had references to frontier violence, and was worked upon by Aboriginal people in the post-Contact period. More recently, a re-creation of a Bora ground for a movie was established on the property with inputs from Elders of the community.	Historical, through its association with frontier conflict, pastoral work and the making of a major Australian film. Contemporary, because of its continued importance in the local folklore.	Historical/social history place	None
Bellbrook Township	OMPS-CS9	The current Bellbrook township, east of the Project area. The town has a long history with the local Thunggutti people, including both working on the previous station that encompasses the site; and the contemporary population that still lives there.	Historical, due to its association with Aboriginal people in the pastoral industry and the making of a major Australian film. Contemporary, due to its importance in recognising the continued Thunggutti presence and the existence of their Creation stories that explain the landscape.	Historical/social history place	None
Bellbrook Reserve – formerly Nulla Nulla Creek Aboriginal Reserve	OMPS-CS10	A former historical Aboriginal reserve situated near the town of Bellbrook. This site is outlined further in Section 5.3.3 and remains an area where a significant contemporary Thunggutti community reside.	Historical, as the place where Thunggutti people were moved to from the late-19 th century. Contemporary, through its role as the residential heartland of the present day Thunggutti community.	Historical/social history place	None
Nulla Nulla Creek	OMPS-CS11	A minor permanent creek that runs from Macleay River to the east of the Bellbrook township and Reserve. It has close connections to a Thunggutti Dreaming creation story, has documented gender restricted activities, and has been and continues to be used as a recreational area for the contemporary Aboriginal community.	Cultural, associations with Creation stories and the presence of gender-restricted places. Contemporary, through its importance for maintaining Thunggutti fishing traditions.	Cultural/social history place	None
Sugarloaf Mountain (Mount Anderson, <i>Barrarr balayi</i>)	OMPS-CS12	A prominent mountain that is situated north of and dominates the Bellbrook township skyline. The mountain is well known within the Thunggutti community and is associated with a well known Creation story – in which a Goanna had his poison stolen by the Carpet Snake – and gender-restricted activities.	Cultural, associations with Creation stories and with ‘men’s business’.	Cultural	None



Source: EMM (2022); DFSI (2017); GA (2011); SMEC (2022)

- | | |
|--|--|
| KEY | |
| Project area | Existing environment |
| ● Cultural sites | Road |
| ● Ceremonial | Track |
| ● Ceremonial, historic & contemporary residential | — Macleay River |
| ● Historic | — Watercourse/drainage line |
| ● Historic & recreational | NPWS reserve |
| | State forest |

0 5 10 km
GDA 1994 MGA Zone 56

Cultural values mapping findings

Owen Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
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Figure 5.3



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5.5 Other information provided by RAPs

In addition to the information obtained from documentary sources and cultural mapping investigations, additional comments were made by the RAPs during the consultation process that are relevant to this section. These include:

- Arthur Bain (TLALC, pers comm 9 Dec 2021) advised that the ranges (Carrai) to the west of Bellbrook were traditionally referred to as the Mirri Buka ranges. The literal translation is dead or stinky dog. There are a number of stories about how this came about, including reference to massacres, and a ridge line that looks like a dead dog. *Mirri* is Thunggutti for dog and *buka* means either dead or stinky.
- Bruce Cohen has advised that he has knowledge of ancestors that used to work on the Kunderang Station.
- Steve Ahoy has mentioned the use of Georges Junction as a camping location both in the post-Contact and contemporary period. Steve was also aware of a pre-Contact axe quarry site located east of Georges Junction, and which has formed a focus of the archaeological program of the ACHA.

6 Archaeological context

6.1 Key findings

- Limited dating of a rockshelter and associated alluvial floodplains along Kunderang Brook, 25 km south of the Project area, suggests the scouring of the floodplains of the Macleay at 3,000 years ago, removing many sites that may have been present prior to this date. In this limited study, Aboriginal occupation of the area recommences around 1,500 BP in subsurface deposits, with age/depth models suggesting surface sites are likely no older than 500 years at most.
- The pattern of occupation of the 'Falls country' by Aboriginal people has previously thought to have been a cycle of migratory movement, accessing the milder micro-climates created within the gorges of Falls country as a place of refuge during severe winters. However, more recent studies suggest that the region may have been occupied all year round by small mobile groups who could adapt more quickly to the harsh conditions of the region.
- Previous archaeological studies of the region are extremely sparse, and past studies have focussed on the anthropological aspects of Aboriginal heritage and the post-Contact period. Archaeologically, there has been less investigation in this region, and sites appear to have been recorded these appear to have been recorded opportunistically or as part of limited development activities and/or research activities. Where documented, these sites appear to reflect a fairly ephemeral activity of the region, with most reflecting an isolated or small density of artefacts, perhaps indicative of a single use campsite.
- Based on the regional information and characteristics of the Project area, cultural materials dominated by various stone artefact densities would be expected, especially along Macleay River and lesser tributaries. There is also some potential for a range of other site types, including rockshelters, stone arrangements and culturally modified trees. However, the survivability of such cultural materials will be dependent on past disturbance, which in some areas has likely been considerable due to high-energy flooding events and previous use of the landscape for cedar logging.
- A review of Heritage NSW's AHIMS database identified 112 previously documented sites within a search area of ~772km² centred roughly on the Project area. These were similarly dominated by sites of varying densities of stone artefacts (39%), but also included a large number of ceremonial and mythical sites (17%) as well as rarer site types such as rockshelters, grinding grooves, post-contact habitation sites, ceremonial sites, art sites, burials and culturally modified trees. A number of massacre sites were also identified, reflecting the often violent history between Aboriginal people and European colonisers in the region.
- Prior to fieldwork undertaken for this assessment, three sites were identified within the Project area (AHIMS #21-5-0142, #21-5-0143 and #21-5-0011) and one site (#21-5-0023) is documented within 100 m of the Project area boundary, with the majority further than 2 km away. This includes two sites (an artefact scatter, and a culturally modified tree and gathering place) clustered near Georges Junction, located on a spur abutting the Macleay River on the eastern bank (#21-5-0142 and #21-5-0143); one stone arrangement (#21-5-0011) on a steep spur abutting the Macleay to the south of the Project area; and, finally, a well-documented catfish increase site (#21-5-0023). No sites documented prior to this assessment are located within the construction envelope or disturbance footprint.
- Since 2010, no Aboriginal Heritage Impact Permits (AHIP) have been issued within the Project area.

6.2 Occupation model

The Project area is located within 'Falls country', an area characterised by high ridgelines and steep, incised valleys and gorges following waterways of the Macleay River catchment, with occasional broad flats, slopes and terraces. Falls country is situated between the tablelands and plateaus of the New England region to the west, and coastal margins to the east.

Models of Aboriginal settlement and population movements continue to be refined for the area and largely centre on the degree to which Aboriginal people moved between the coast and plateaus. Some historians argue that the Falls country was not used prior to European settlement. The pattern of occupation of the 'Falls country' by Aboriginal people was thought to have been a cycle of migratory movement, accessing the milder micro-climates created within the gorges of Falls country as a place of refuge during severe winters (Binns and McBryde 1972, Bowdler and Coleman 1981, JSHC 2003, p. 105). Blomfield (1981) suggests the Falls country was uninhabited by Aboriginal people prior to European settlement, which forced Aboriginal people into this 'marginal' zone. However, even as early as Oxley's expedition through Falls country in 1818, he observed, on a number of occasions, camps and campfires, which as he put it, 'announced a country well-inhabited' (Oxley 1820, p. 308). More recent regional studies have suggested a more complex pattern of movement through the landscape. Because the Falls country was marginal pastoral land, it was a place where many Aboriginal people retreated from the adjacent coastal and plateau lands and was a place where traditional lifestyles and practices were able to persist for longer than surrounding regions with areas of occupation connected via transitory routes along river corridors, river flats and ridgelines (JSHC 2003, p. 105).

There is evidence to suggest that during the later Holocene, Aboriginal occupation in the region increased, including a high number of ceremonial sites (Appleton, Beck, and Haworth 2015). Potential drivers for this change suggest that the drier, more uncertain climate conditions of the late Holocene would have concentrated game around more reliable resources, such as waterways of the Macleay River catchment found within the 'Falls country', which became the focus of consumption and exchange for Aboriginal people. In turn, the concentration of resources would have supported larger numbers of people associated with ceremonial activity. The increase in social connectivity through ceremonial activity at this time may have been both a cause and effect of the spread of new technologies in stone implement manufacture and exchange. The study highlights that ceremonial places occur more frequently than in other regions and in clusters (Beck 2006).

6.3 Regional context

Systematic archaeological studies of the Falls country have been limited primarily due to the steep terrain and issues with accessibility, with development driven investigations and academic research to date largely focusing on the neighbouring New England Tablelands. Davidson (1975, 1982) acknowledged this limitation, noting the 'Falls country' being overlooked as 'the bit in the middle' between coastal plains and tablelands.

Archaeologically, recent genomic research suggests that peopling of Australia had been completed fairly quickly following arrival at ~50,000 years ago, and a form of regional nomadism – whereby resources were only visited and/or occupied for a brief time, but which were repeatedly visited as conditions allowed – was established by ~42,000 years ago and suggest an extremely long connection with country (Tobler et al 2017). For much of this time, populations remained low, before undertaking significant increase and socio-economic change in the last 5-10,000 years (Williams et al 2015). Archaeological and linguistic evidence suggests that the Tablelands were most intensively occupied from around 4,000 years ago (Beck 2006). This is based on the finds of surface or near-surface artefacts, with very little found at greater depth. The oldest known Aboriginal site (c 4,300 years old) is near Bendemeer on the southern edge of the Tablelands (roughly 50 km west of the Project area).

The closest dated sites in the vicinity of the Project area appear to be a cave site approximately 25 km to the south of the Project area, along Kunderang Brook at a site called Harmonica Cave. Radiocarbon samples from this site appear to date the basal units, synonymous with the initial occupation layer, to $1,510 \pm 70$ BP (Godwin 1990, p. 238). Using an age/depth curve, the upper deposit of the cave was dated to 20 BP, or c. 1930 which aligns with the reported use of the cave by Alan Youdale, an early grazier in the region, who used the shelter as a camp. The excavation recovered the harmonica he played at the time within the uppermost deposits, which lends itself to the cave's name (Godwin 1990, p. 238). In addition, Goodwin's study reported dates from alluvial material at the base of floodplains around the Macleay Falls area (generally near the headwaters of the Macleay River, to the southwest of the Project area) suggest the current floodplains of the Macleay developed 2,500-3,000 BP, following extensive scouring in the catchment of sediments formed prior to this date. Goodwin (1990, p. 239) writes:

The location of a rockshelter with a basal date of c. 500 [BP] in eroding colluvial deposits on the margin of one of these floodplains is highly suggestive that Aboriginal exploitation of the Macleay Falls following the scouring of the floodplains at 3,000 [BP] may have (re)commenced at about 1,500 [BP]. In this case, the open sites found on these floodplains must postdate this. In view of the fact that sediment deposition and floodplain accretion is a continuing process until river flow exceeds overbank capacity, initiating scouring of deposits hence removal of sites, the presence of these sites at no great depth below present floodplain surface level likewise indicates that the sites are of no great antiquity and are probably no older than 500 years at most.

This offers some insight into the sites on alluvial deposits, open sites situated on colluvial deposits, albeit in close proximity to the floodplains and the river. While no robust dating was undertaken for this geomorphological deposit, comparison of artefact assemblages from these two landforms suggests there is no clear evidence of the sites in colluvial contexts being significantly different to those on the alluvial floodplains (Goodwin 1990, p. 239).

Rarer site types, such as carved trees, ceremonial Bora grounds and art sites have all been identified within the Tablelands and indicate the original inhabitants' important spiritual and physical connection to the landscape. Other surviving material remains include seed grinding and axe grinding grooves in rock slabs, cooking areas and stone artefact scatters representing open camp sites. Research suggests that Aboriginal occupation was patterned, not random. With activities in the landscape focused on places where people lived and worked (quarries, camp sites and ceremonial sites), with a preference for areas with clustered resources (e.g. lagoons), and also along tracks and pathways which were followed for ritual and secular purposes (Appleton, Beck, and Haworth 2015). Transitory areas feature fewer archaeological traces, sometimes only marked by isolated or low-density stone artefact scatters. Stone quarry and grinding groove sites are site types that represent more utilitarian, even industrial practices. Stone quarries are relatively common in the Tablelands and range from significant quarries such as that at Moore Creek (roughly 80 km south-west), to smaller but significant working areas on isolated outcrops such as the Boorolong Hill stone quarry site (AHIMS #21-1-0088, 1.4 km east of the Project area). In conjunction with movement for ceremony, transferring local materials was a common practice and explains the presence of 'exotic' materials as far as 50 km away (Hudson 1996). Archaeological evidence of burials has been identified in rockshelters but also as open sites marked by earth mounds, piles of stones and nearby carved trees (McBryde 1974). Stone tools changed over time whereby stone artefacts from 5,000–10,000 years ago became smaller than previously made and included backed artefacts and points.

In the later Holocene, Aboriginal occupation in upland areas became more visible in the archaeological record, including a number of ceremonial sites in conjunction with lagoons (Appleton, Beck, and Haworth 2015). Stone arrangements in various groupings such as cairns, circles, lines and corridors have also been identified although not a lot is known about them.

6.4 Local context

Previous studies of the Falls Country are extremely sparse, and in part due to the rugged and inaccessible terrain, and due to the lack of development that results in cultural heritage management investigations. To date, past studies have focussed on the anthropological aspects of Aboriginal heritage and the post-Contact period, which has been richly documented (Chapter 5). Archaeologically, there has been less investigation in this region, and documented sites in the Falls country appear to be recorded opportunistically or as part of limited development activities and/or research activities.

The below presents a summary of available assessments or studies completed within proximity of the Project area.

Study:	Oven Mountain Pumped Storage Plant Project Review
Reference:	Mills 1996 (reported in Maunsell 2009)
Distance from Project area:	Encompassing the Project area

A preliminary heritage assessment of the Project was undertaken by Mills (1996) which included part of the current Project area. This document is not directly accessible, and the below presents a summary following the limited information referenced in Maunsell (2009).

Mills' (1996) assessment included literature review, desktop analysis and limited site investigations. Survey resulted in the identification of three sites: an artefact scatter with a potential archaeological deposit, an isolated artefact, and a historical burial of an Aboriginal youth. These sites are believed to be associated with AHIMS registrations AHIMS 21-5-0041, 21-5-0066 and 21-5-0071 (refer to Section 6.5).

Study:	Oven Mountain Pumped Hydro Storage Project Desktop Aboriginal Heritage Due Diligence Assessment
Reference:	NGH 2021
Distance from the Project area:	Encompassing the Project area

NGH Pty Ltd (NGH) was engaged by OMPS to undertake a desktop Aboriginal heritage due diligence assessment to assess potential impacts of the proposed geotechnical investigations and groundwater monitoring program which are required to inform the design of the proposed pumped hydro energy storage near the Macleay River between Armidale and Kempsey, NSW.

By reviewing the landscape, previous Aboriginal heritage studies and registered Aboriginal site distributions, NGH (2021) predicted that the OMPS project area includes areas of low, to moderate, to high potential to feature Aboriginal objects. Areas of higher potential are particularly in association with the Macleay River flats, as well as the raised spurs and elevated ridges associated with Oven Mountain. For raw material procurement, NGH considered both the Macleay River and rock outcropping on the escarpment were considered potential resources for stone tool manufacture. However, upon review for this assessment, the geological mapping does not appear to identify clear sources of raw material suitable for Aboriginal stone tool manufacture (e.g. silcrete, chert), though the site inspection identified abundant milky quartz cobbles and gravels along the escarpment, which might have been utilised. For superior quality raw material, however, it is likely this area was dependent on secondary sources (e.g. river cobbles) transported by the Macleay River from elsewhere. The near vertical escarpment west of the Carrai Plateau was also considered to have rockshelter potential, though this is considered limited by accessibility to these areas. In addition, the OMPS Project area contains several significant water resources that were likely utilised by Aboriginal people in the past, namely the Macleay River and – to a lesser extent – it's associated tributaries. These watercourses have the potential to retain deep alluvial soil profiles, and in turn may preserve buried cultural material and other evidence of Aboriginal use, likely in the form of stone artefact sites.

NGH recommended that a visual inspection of the proposed works locations and/or areas be undertaken by a qualified archaeologist prior to commencement of works because the desktop assessment identified some potential for Aboriginal objects to occur in the landscape. The purpose of the site inspection was to ground truth the nine proposed borehole locations, and the proposed new access routes, to identify any visible Aboriginal objects and areas of archaeological potential (i.e. subsurface Aboriginal objects) that may be present.

EMM (2021) provided services to complete the site inspection associated with these works and recorded no Aboriginal objects within any of the areas inspected. However, ground surface visibility for the detection of surface artefacts was greatly hindered by dense grass cover. Ultimately, two locations proposed for geotechnical boreholes were identified as retaining moderate archaeological sensitivity (Site 1 and Site 3), and one portion of the proposed access track was also identified as retaining moderate archaeological sensitivity. These findings largely relate to the identification of favourable landform contexts in these areas which are indicative of possible past Aboriginal occupation and/or transitory movement between high and low topographies.

Study: An Archaeological assessment of the State Forest of NSW's Walcha-Nundle and Styx River Management Areas

Reference: Davies 1993

Distance from Project area: Encompassing the Project area

An archaeological survey of Aboriginal sites within State Forests between Walcha-Nundle and Styx River was undertaken by the University of Queensland Archaeological Services unit. The project aimed to create a predictive model and to understand the impact of forestry activities on archaeological sites using non-probabilistic sampling. The survey identified 49 artefact occurrences which were dominated by stone artefact scatters (n=44). The 187 individual artefacts found within these occurrences were comprised of flakes (n=100), broken flakes (n=40), flaked pieces (n=24), cores (n=19), hammerstones (n=1), geometric microliths (n=1) and backed blades (n=2). The assemblage was dominated by chert (81%) but basalt, quartz, quartzite and greywacke were also documented. High instances of retouching (15%) and low cortex levels (5%) indicate the source of these materials was not located close to the Project area. Most artefact occurrences were situated within 200 m of a known water source (55%) as well as saddles and mid slope benches. Recommendations included avoiding impact to the crest and immediate slopes of the Giro Fire Trail, establishing a 25 m radius buffer zone around sacred trees, and the further investigation and documentation of areas identified with high archaeological potential and rockshelters.

Study: Kunderang East Pastoral Station Oxley Wild Rivers National Park Conservation Management Plan

Reference: Jill Sheppard Heritage Consultants (JSHC) 2003

Distance from Project area: Adjacent to the southwestern extent of the Project area

The Kunderang East Pastoral Station, covering a total of 32,000 ha located adjacent to the south-eastern extent of the current Project area, was acquired by the NSW National Parks and Wildlife Service (NSW NPWS) in 1989 for incorporation into the Oxley Wild Rivers National Park. Jill Sheppard Heritage Consultants (JSHC 2003) were engaged to prepare a Conservation Management Plan (CMP) for cultural and natural features within the station property including Aboriginal archaeology. Specialist inputs to the CMP were provided by archaeologists Susan McIntyre-Tamwoy and Mary Dallas who contributed to assessments of Aboriginal archaeology including survey and analysis, as well as consultation with Aboriginal stakeholders.

At the time of the study, a total of 15 previously registered Aboriginal sites occurred within a 15 km radius of the station (these sites are captured in AHIMS data for the current Project as per Section 6.5). These included six open artefact scatters (AHIMS 21-5-0041, 21-5-0042, 21-5-0043, 21-5-0045, 21-5-0046, and 21-5-0050), three natural mythological sites (AHIMS 21-3-0003, 21-5-0005, 21-5-0023), two massacre sites (AHIMS 21-5-0064 and 21-5-0065), two scarred trees (AHIMS 21-5-0069 and 21-5-0070), one stone arrangement (AHIMS 21-5-0011), and one burial (AHIMS 21-5-0066). Artefact scatters were predominantly associated with alluvial deposits adjacent to or overlooking the Macleay River and Kunderang Brook, with assemblages comprised of flakes and cores of argillite and chert (JSHC 2003, pp. 78-79).

Archaeological surveys identified areas of sensitivity as river terraces and spurs, with areas surrounding station features including homesteads and huts having potential to contain post-contact archaeological deposits (JSHC 2003, p. 79). Unfortunately, detailed results of archaeological survey completed as part of investigations are not provided in the CMP, beyond noting that additional artefact scatters were identified in exposures along the top of the terrace and at the gate of the homestead yard (JSHC 2003, p. 80).

The cultural significance assessment of the CMP (JSHC 2003, pp. 105-107) notes “the station is highly significant to Aboriginal people because of its documented and locally well-known continuity of association between the place and Aboriginal people from prehistoric times through European occupation”.

Study: Comara Range Excavation, Nulla Five Day State Forest, Mid North Coast NSW

Reference: Lomax 1994

Distance from Project area: Approximately 19 km south-east of the Project area

A 16-day salvage excavation of a low-density artefact scatter (AHIMS #21-5-0054) situated on a small shallow saddle on a narrow bridge was undertaken by State Forest representatives. At the time of excavation, the western side of the site had been impacted by a four-wheel drive track. A total of 197 artefacts were recovered during the excavation, with an artefact density of 17.1 per square meter. The assemblage consisted mainly of small flakes and flaked pieces less than 2 cm in diameter (n=116). The most common material found in an assemblage was argillite (57%) but chert, quartz, acid volcanic and basic volcanics were also present. Low cortex levels and high levels of retouching indicate raw materials were not abundant locally. The site’s low-density and lack of spatial structure indicate the site was used as a short-term campsite for groups travelling between the tablelands and the Macleay River Valley during the mid-late Holocene.

Study:

An Archaeological Assessment of State Forests in the Kempsey and Wauchope Forestry Management Areas

Reference: Packard 1992

Distance from Project area: Approximately 66 km south-east of the Project Area

Packard undertook a desktop and site survey of Crown-Timber owned state forests in Kempsey and Wauchope which had previously been the subject of little investigation. The Project area stretched over 325,000 ha. The survey identified 55 sites within the forest and another 2 within close proximity. 21 sites consisted of single flaked stone artefacts, one small rockshelter associated with an isolated stone artefact, and the remaining 33 consisted of artefact scatters of flaked stone. The site density within the state forest was calculated as 1.4 sites per square km.

In line with wider trends from the wider north coast region with a noticeably higher number of mythological and ceremonial sites in comparison to occupation and economic sites.

Study:	Aboriginal Historic Sites in North-East NSW: Management Study
Reference:	Rich 1990
Distance from Project area:	Encompassing the Project area and across broader NSW

Rich, using a grant from the National Estate, undertook a widespread study of post-contact Aboriginal sites across the north-east of NSW including the Hunter Valley, Tamworth, North West Slopes, The Northern Tablelands, The Mid North Coast and the Far North Coast. Following the survey, a total of 311 sites, comprising of 29 site types, were identified. Within the Northern Tablelands specifically 51 potential historic sites were identified across the categories of cultural sites, burials, warfare sites, occupation sites, reserves, places of importance and other institutions.

Study:	Aboriginal Heritage in the Kempsey Shire: A Report for the Aboriginal People
Reference:	Oxley 1989
Distance from Project area:	Approximately 66 km south-east of the Project area and across broader NSW

The study comprised of three reports documenting the history of the Kempsey Shire, its cultural resources and heritage through the eyes of Aboriginal people. A conservation plan was also prepared based on the recorded data. The reports revealed that 257 sites had been documented in Kempsey Shire by 1989 with middens dominating followed by open artefact sites and natural/mythical places. Within the report's survey area, sites were most commonly along flat ridgelines leading into valleys and moderate slopes above creeks or swampy grounds. Artefact density along ridgelines was between 2–4 artefacts per square m and extended between 10 and 40 m.

The study documented a range of cultural sites across the landscape including Mount Anderson (AHIMS #21-6-0014; roughly 250 km southwest), Long Galley Initiation Area and Blue Groper sites in the Bellbrook area, fish etchings, imprints of Birrogun's feet and burial place at South West Rocks, a burial ground at Jerseyville (AHIMS # 22-4-0016), ceremonial ground at Gapp Creek, burials at Pelican and Fattorini Islands as well as Old and New Burnt Bridge (AHIMS # 30-3-0082). The above findings were used as the basis for a conservation policy which categorised different landforms within the wider landscape into areas of low, medium and high sensitivity which delineate what actions can be taken in that area.

Study:	Archaeological Site Surveys on the Eastern Margin of the New England Tablelands
Reference:	Godwin 1983
Distance from Project area:	Approximately 30 km south of the Project area

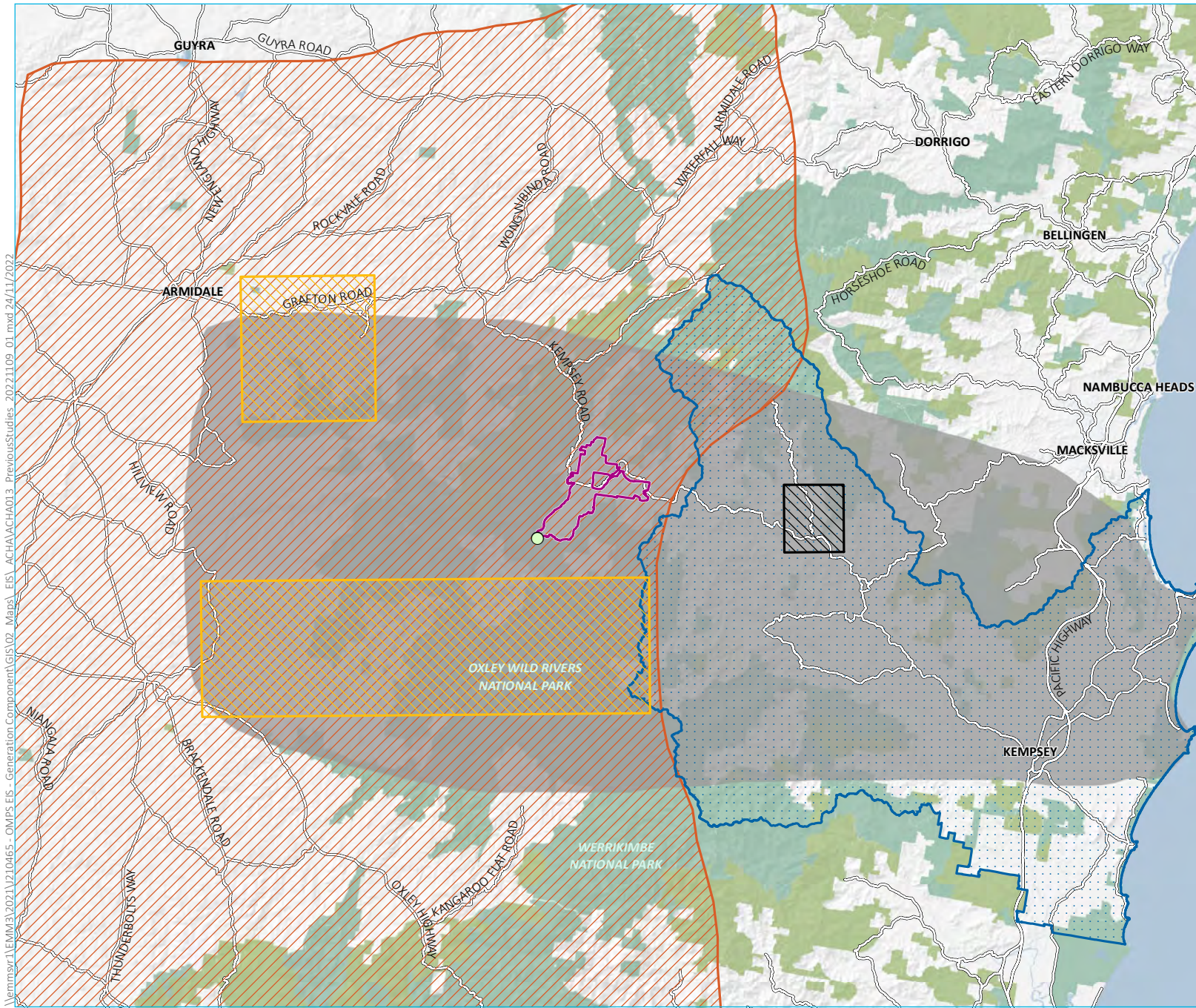
Multiple surveys were conducted as part of a regional study based in the eastern margins of the New England Tablelands roughly 60 km south of Armidale, spreading east of Walcha toward Kempsey. Sites closest to the Project area surround Apsley River (~13 km west) consisted of stone artefact scatters (n=4) with a further six artefact sites identified throughout the region. This study suggests that contrary to earlier studies (Bowdler 1981), sites can be found above elevations of 1000 m. The study called for a modification for Aboriginal occupation models throughout the New England Tablelands along with more comprehensive surveys of the area to create more detailed pictures of past Aboriginal resource exploitation.

Study:	Berarngutta to Gulgarng: Investigations of Aboriginal Sites of Significance from Points Lookout to South West Rocks
Reference:	Creamer 1979/1981 (consolidated report)
Distance from Project area:	Incorporates the Project area and broader NSW

A cultural survey spanning from Point Lookout in the New England National Park to adjacent to the current Project area, a distance of ~100 km. The report lists an array of different sites in addition to intangible heritage. Nulla Nulla Creek at Bellbrook for example was made by *ngugundge* (a porcupine) who was being chased by a group of hunters. While the animal was too large for the hunters to kill, their spears became the porcupine's quills. Other sites linked to cultural stories include Kemps Pinnacle, Burning Hill and Lagers Point.

Two cultural sites of particular importance (AHIMS #21-5-0003 and #21-5-0023) were also recorded within the vicinity of Creamer's study area, which were known as *Wilung-Gajai*. The sites are marked by a rock at the junction of George's River and the Macleay River and at the river bend at Pee Dee are significant due to their role in increasing *wilung* (catfish) and *darwar/ngah-goy* (turtle), respectively. Byrne (2021) stated that AHIMS #25-5-0003 is not directly mentioned in Creamer's report. The site card indicates it was recorded as a camping ground and sacred site by Ron Green. Burials were documented at Five Day Creek, a tributary of the Macleay and northeast of the current Project area which is believed to hold two bodies. Initiation sites are located at Gap Creek and Long Gully.

All of the cultural sites documented by Creamer were situated on a mountain or within/next to a body of water. The report also identified a massacre site at Towal Creek, however, it is unclear how many were killed; and shootings at Kunderang Creek and Jacks Flat near Pee Dee.



- Project area
- Major road
- Named waterbody
- NPWS reserve
- State forest
- Previous studies
- Mills (1996)
- Creamer (1979 and 1981)
- Davies (1993)
- Godwin (1983)
- Lamox (1994)
- Oxley (1989)

Map of previous studies in the local area

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 6.1



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Source: EMM (2022); DFSI (2020, 2021); GA (2011, 2020); ABS (2021)

6.5 AHIMS data

The Aboriginal Heritage Information Management System (AHIMS) database is managed by Heritage NSW and includes a location and description of Aboriginal objects and sites recorded through academic research and cultural resource management (see Attachment E.1 for further explanation of Aboriginal site features). EMM conducted two searches of the AHIMS register. The first on 2 August 2021 (ID: 609341) and the second on 24 February 2022 (ID: 662527) to include the proposed ETL and access road. The combined search covered roughly 772 km² centred on the Project area. The search identified any Aboriginal sites or places registered within the Project area and aids predictions for the Project area showing the frequency and distribution of Aboriginal site types in the broader landscape. A copy of both AHIMS searches is provided in Attachment E.1.

The AHIMS searches identified 112 Aboriginal sites and/or Aboriginal Places, which are categorised in Table 6.1 and their locations presented in Figure 6.2.

Of these, six sites (AHIMS #21-5-0007, #21-5-0121, #21-5-0005, #21-5-0137, 21-5-0136 and #21-5-0134) have gender and/or location based restrictions applied, and one site (#21-5-0028) has been determined to not be an Aboriginal site. Clarification sought from Heritage NSW in August 2021, informed EMM that none of the restricted sites are located within the Project area (Attachment E.2). One site (#21-6-0363) appears to be a repatriation of remains of an Aboriginal man and woman, that were exposed during major flood events in the 1950s, which scoured the banks of the Macleay. Some site names imply some duplication of recording, for example, 21-6-0014/ Mount Anderson Anderson's Sugarloaf and 21-6-0168/Burrel Bulai both appear to capture the cultural and ceremonial significance of the mountain overshadowing Bellbrook.

Three Aboriginal Places are in the general vicinity of the Project area. An Aboriginal Place is an area of land declared by the Minister of Environment and Heritage to be of special significance with respect to Aboriginal culture. These Places are offered additional protections under section 84 of the *National Parks and Wildlife Act 1974*. Aboriginal places in the vicinity of the Project area include Carrai Waterholes (discussed in detail in Chapter 5; also #21-5-0005), Burrel Bulai (discussed in detail in Chapter 5; also Barralbarayi, Mount Sugarloaf, Anderson's Sugarloaf and Mount Anderson; also #21-6-0168), and Long Gully (#21-6-0015). Long Gully refers to a passing out parade ground used in the latter stages of initiations by the Thunggutti. The ground is hidden by two high ridges, where ceremonies could be held privately. The last initiation ceremony held here was in 1932 and is also discussed in Section 5.2.2 and Appendix D. In 1979, when the site was declared an Aboriginal Place, several men who were initiated at the site were still alive and actively sought protection for the site. All are located outside the Project area, with #21-5-0005 being these closest (~3 km south west).

A number of site types are represented, and include ceremony and dreaming sites, resource gathering sites, artefact scatters, art sites, culturally modified trees, quarries, stone arrangements and burial sites. The most common site type in the region are artefactual sites (n=44, 39%). Of these, artefactual sites are most frequently unidentified artefactual sites, isolated finds (n=13, 12%) or low-density (<10) artefact scatters (n=9, 8%), though many remain undefined (n=22, 20%). Artefacts often are not recorded in association with other site types, with a notable exception being the cluster around the East Kunderang Homestead, adjacent southwest to the Project area. In addition, no sites have been registered as featuring potential archaeological deposits (PADs), which may be reflective of the steep, rugged, and highly erodible terrain of the surrounding Falls Country. Generally, artefact sites appear to be found in close proximity to water, frequently more substantial, named watercourses, and/or following high ridgelines where travel would be easier within the rugged terrain.

A number of increasingly rare site types are also documented in relative abundance in the region compared with other parts of NSW, with Aboriginal ceremony and Dreaming³ sites forming the second most frequent site type (n=19, 17%). Most frequently, these appear to be ceremony and Dreaming sites with associated natural mythological and/or ritual significance (n=13, 12%), and include story places (e.g. #21-6-0098) and increase sites for catfish (#21-5-0023), turtle (#21-5-0027), and possum (#21-6-0023). These sites also appear to be associated with historical pastoral stations (e.g. #21-5-0025 / Towel Creek Station, and 21-5-0009/Peedee Station); bora grounds (#21-5-006); and burials (e.g. #21-6-0013). Other notable sites include a number of burial sites (n=7, 6%) and art/engraving sites (n=2, 2%). The burial sites (#21-6-0086, #21-6-0021, #21-6-0363, #21-5-0026, #21-5-0008, #21-5-0066, and #21-5-0001) appear to gravitate near the confluence of significant waterways in the region. Notably, art site #21-5-0072 / Carrai Engravings, may be associated with the engraving site mentioned by participants in the cultural mapping activities, located ~10 km to the south east of the Project area (see Figure 6.2).

Lesser occurrences of rarer archaeological site types include culturally modified trees (n=6, 5%), habitation structures (n=6, 5%) and stone arrangements (n=3, 3%). In the case of modified trees, this low value might be related to the aligned with the cedar felling documented in the 19th Century, which devegetated large portions of the region. The habitation structures are exclusively documented in the vicinity of East Kunderang Homestead, which has a well-documented history of Aboriginal people living and working at the station in the post-Contact period and likely relate to that documented occupation. Stone arrangements are poorly described in the literature, and no clear distribution pattern is evident from the few documented instances. Finally, six massacre sites were identified within the search parameters and reflect the often violent history between Aboriginal people and colonisers in the region (see Chapter 5). All appear to be associated with well-documented violence on historical pastoral stations including two (#21-5-0064 and #21-5-0065) associated with Kunderang Station (East and West), two (#21-5-0031 and #21-5-0032) associated with Pee Dee Station, and one (#21-5-0068) associated Sheep Station. A further massacre site is associated with Towel Creek, ~10 km to the east of the Project area. No documented massacre sites have been recorded within the Project area.

With respect to site distribution, archaeological sites (i.e. artefact sites, culturally modified trees, burials, etc.) are mainly concentrated around the Macleay River and other major watercourses in the region. However, due to the high number of cultural and spiritual sites in the area, it is difficult to model site patterning for a number of the sites documented within the region as they do not necessarily gravitate to resource rich areas and/or specific landforms in the same way occupation sites do. In addition, a number of sites relate to the continued occupation of Aboriginal people during the post contact period, with Aboriginal people living and working at the numerous stations that were established in the mid-1800s. Past studies in the Falls Country have focussed on the anthropological aspects of Aboriginal heritage, and the history of interactions with Europeans during the post-Contact period. However, these appear to have been recorded opportunistically or as part of limited research activities. Very few development driven studies, which often result in robust cultural heritage management investigations, have occurred in the region

Of the 112 registered sites, three are located within the Project area (#21-5-0011, #21-5-0143, and #21-5-0142) and one site (#21-5-0023) is documented within 100 m of the Project area boundary. This includes two sites clustered near Georges Junction, located on a spur abutting the Macleay River on the eastern bank (#21-5-0142 and #21-5-0143). The site cards are brief but describe an extensive stone artefact scatter with a number of axes (n=154) identified in the assemblage, as well as a culturally modified tree. The site card for #21-5-0143 also identifies the site as a natural 'gathering place for young men entering ceremony' but offers little detail on this association.

³ The use of the term 'Dreaming' is generally avoided in this report as it is Central Australian Aboriginal English term; however, AHIMS documents some sites as 'Aboriginal Ceremony and Dreaming' sites for associated with what would otherwise be termed Creation stories by contemporary Thungutti people.

The other site, #21-5-0011, represents a stone arrangement on a steep spur abutting the Macleay to the south of the Project area. The site card is old, and the photo attached is not clear enough to be visible, and very little description of the shape and form of the arrangement is provided but it appears to be small in size.

The Aboriginal people engaged to identify the site at the time commented that the site had no known Aboriginal significance, and there was some speculation as to whether it was Aboriginal or European in origin. Finally, as mentioned above, #21-5-0023 represents a documented catfish increase site. The site is documented as a large rock located in the Macleay River; to perform the increase ritual, white clay was washed in the river to 'let there be plenty of fish' (Creamer 1979, p. 16). As a cultural site, the site curtilage of this place is poorly defined.

Since 2010, no Aboriginal Heritage Impact Permits (AHIPs) have been issued within the Project area.

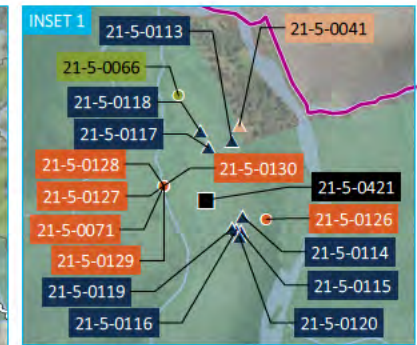
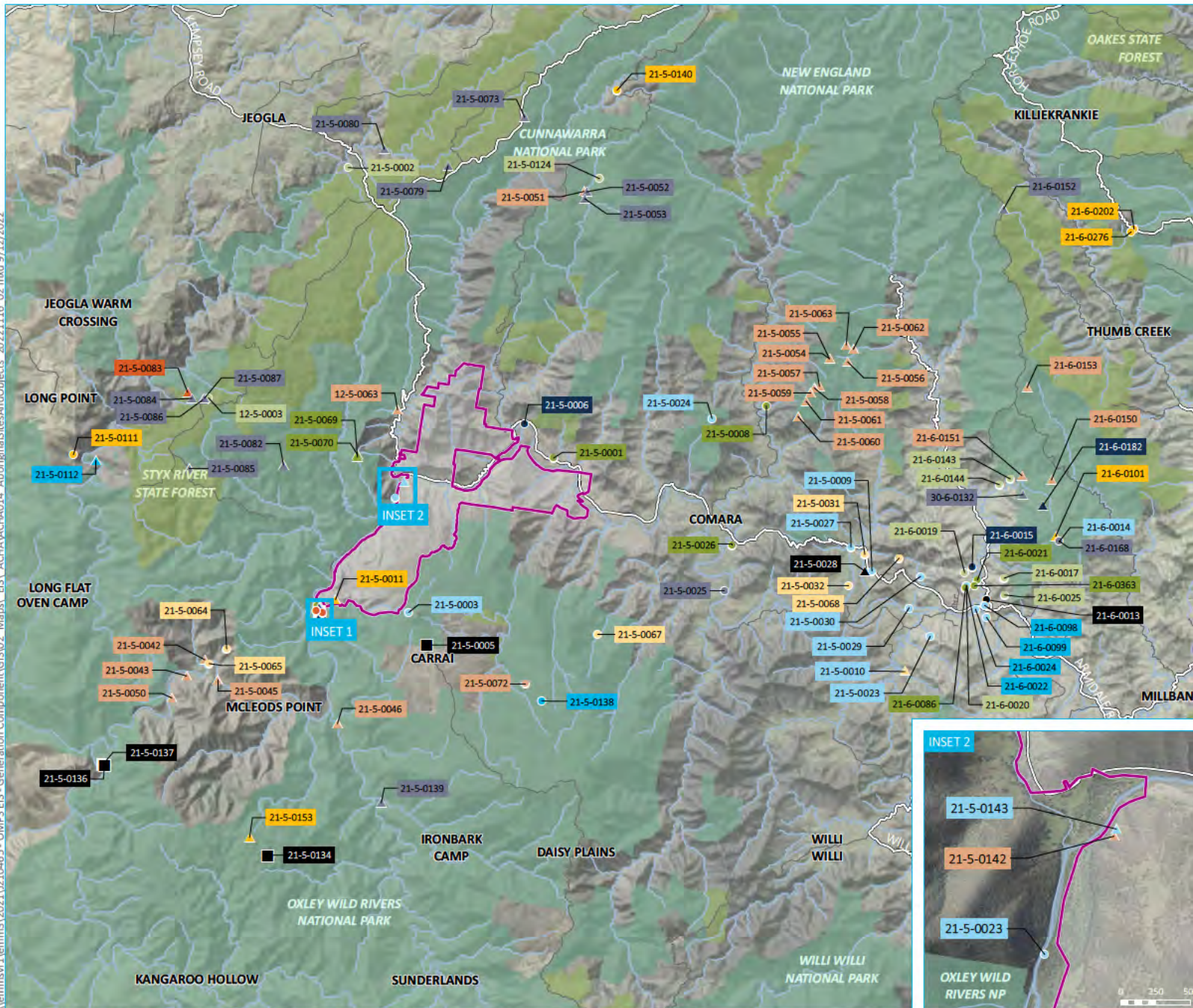
Table 6.1 Summary of AHIMS site within the search area

Site type	Number of sites		% of Total	
	Category total	Sub-category total	Category total	Sub-category total
Aboriginal Ceremony and Dreaming site:	19		16.96	
• Aboriginal ceremony and dreaming.		2		1.79
• Aboriginal ceremony and dreaming site with burial.		1		0.89
• Aboriginal ceremony and dreaming site with Bora/ceremonial ring.		2		1.79
• Aboriginal ceremony and dreaming site with Bora/ceremonial ring and resource and gathering site.		1		0.89
• Aboriginal ceremony and dreaming site with natural mythological and/or ritual significance.		13		11.61
Aboriginal resource and gathering site:	1		0.89	
• Resource and gathering site with modified tree.		1		0.89
Art site (pigment or engraved):	2		1.79	
• Unspecified art site.		1		0.89
• Engraving site.		1		0.89
Artefact site:	44		39.29	
• Isolated artefact.		13		11.61
• Low-density artefact scatter (<10).		9		8.04
• Undefined artefactual site.		22		19.64
Bora/Ceremonial ring (stone or earth).	9		8.04	
Burial site.	7		6.25	
Conflict and/or massacre site.	6		5.36	
Culturally modified tree:	6		5.36	
• Carved or scarred (unspecified).		4		3.57
• Scarred trees.		2		1.79

Table 6.1 Summary of AHIMS site within the search area

Site type	Number of sites		% of Total	
	Category total	Sub-category total	Category total	Sub-category total
Habitation structure.	6		5.36	
Natural resource site:	2		1.79	
• Stone quarry.		1		0.89
• Ochre quarry.		1		0.89
Stone arrangement.	3		2.68	
Not an Aboriginal site.	1		0.89	
Restricted site.	6		5.36	
Total	112	-	100	-

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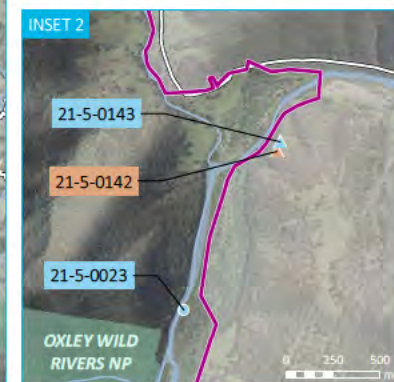


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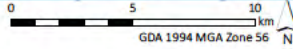
- Project area
- Existing environment
 - Named watercourse
 - Major road
 - Minor road
 - Named waterbody
 - NPWS reserve
 - State forest
- AHIMS site type
 - Aboriginal ceremony and dreaming
 - Aboriginal ceremony and dreaming site with Bora/ceremonial ring
 - Aboriginal ceremony and dreaming site with burial
 - Aboriginal ceremony and dreaming site with Bora/ceremonial ring and resource and gathering site
 - Aboriginal ceremony and dreaming site with natural mythological and/or ritual significance
 - Bora/Ceremonial ring (stone or earth)
 - Burial site
 - Carved or scarred (unspecified)
 - Conflict and/or massacre site
 - Engraving site
 - Habitation structure
 - Isolated artefact
 - Low-density artefact scatter (1-10)
 - Not an Aboriginal Site
 - Ochre quarry
 - Resource and gathering site with modified tree
 - Scarred tree
 - Stone arrangement
 - Stone quarry
 - Undefined artefactual site
 - Unspecified art site
 - Restricted site

Previously documented Aboriginal objects and sites within the AHIMS

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
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 Figure 6.2



Source: EMM (2022); DFSI (2020, 2021); GA (2011, 2020); ARC (2017); DPE (2022); AHIMS (2022)



6.6 Predictive model

Aboriginal occupation of the Project area in the past is considered likely. Previously documented Aboriginal objects and/or sites appear to be found in close proximity to water, frequently more substantial, named watercourses, and/or following high ridgelines where travel would be easier within the rugged terrain. Available data suggests that such sites frequently contain few Aboriginal objects (<10) and are reflective of an ephemeral use of the region. One high density site is documented in the Project area, located on a spur abutting the Macleay River on the eastern bank (#21-5-0142 and #21-5-0143). The site cards are brief but describe an extensive stone artefact scatter with a number of axes (n=154) identified in the assemblage, as well as a culturally modified tree. However, with little comparative data, it remains unclear the threshold at which transient use shifts to occupation foci; more regionally 20–30/m² are often adopted. The presence of alluvial soil profiles along the major waterways may potentially contain deeply buried and/or stratified cultural material, although these waterways have likely been impacted by changes in morphology (increased erosion/sediment deposition). Indeed, limited dating of a rockshelter and associated alluvial floodplains along Kunderang Brook, 25 km south of the Project area, suggests the scouring of the floodplains of the Macleay at 3,000 BP, removing many sites that may have been present prior to this date. In this limited study, Aboriginal occupation of the area recommences around 1,500 BP in subsurface deposits, with age/depth models suggesting surface sites are likely no older than 500 years at most.

Past studies and previously documented Aboriginal heritage within the region have been limited. This is in part due to the rugged and inaccessible terrain, and due to the lack of development that results in cultural heritage management investigations. To date, past studies have focussed on the anthropological aspects of Aboriginal heritage and the post-Contact period. The region has a deep history in these fields, with some 17% of previously identified sites reflecting mythological and/or ceremonial sites important to the Thunggutti people, story places and increase sites for catfish, turtle, and possum. Numerous bora grounds have been documented in the region as well, with ceremonies in the region documented well into the 20th century. This is in stark contrast to other studies in the broader region along the eastern coast and New England Tablelands, which are dominated by archaeological signatures.

A range of other site types are known in lesser abundance, and arguably of higher significance, including culturally modified trees, ceremonial sites, quarries, stone arrangements, grinding grooves, rockshelters, habitation structures, and natural resource sites. These consist of about 46% of the documentary record, values that are likely above average for such site types more generally across NSW. Several of these sites are considered unlikely to be present due to the environmental context – a narrow upper reach river valley lacking vertical escarpments and highly erosive limiting the likelihood of rockshelters, grinding grooves and/or quarries, for example. However, a number of these sites – notably ceremonial sites and stone arrangements - are not related to resource exploitation and as such may not follow the environmental site predictions outlined above. It should be highlighted that intensive cedar logging and agricultural land use may have disturbed or removed sites and the grazing paddocks that characterise the landscape may be covering surface archaeological material dependent on the extent of grasses and intensity of livestock grazing.

On the basis of the archaeological sites registered in the region, a review of previous archaeological studies and the environmental context, Table 6.2 draws conclusions regarding the potential presence and location of Aboriginal sites within the Project area.

Table 6.2 Predictive model of site location

Site type	Predictions for Project area
Open artefact sites and isolated finds	<p>Open stone artefact scatters and isolated finds are the site types most likely to occur in the Project area. These may occur anywhere as background scatter but are most likely to occur close to reliable sources of water (generally within 200 m). Although stone artefact sites may be present in these areas, their detection is dependent on favourable ground surface visibility conditions. Further, more recent ground disturbance, for instance through farming or flooding, will have an effect on the accuracy of the predictive model.</p> <p>High sensitivity for open stone artefact sites includes level to gently inclined, elevated landforms near high order streams including crests, spurs, terraces and lower slopes/foot slopes that were above regular inundation and provided good outlook.</p> <p>Smaller and lower density artefact scatters and isolated artefacts may occur near the ephemeral tributaries (3rd order and below). Isolated artefacts or small artefact scatters may occur anywhere away from watercourses. These are most likely to be identified on level to gently inclined terrain but not moderately inclined areas that would have been too steep for occupation or on low-lying floodplains where regular inundation would have prevented focussed activities. Where identified on more steeply sloped terrain, this is likely indicative of downwards movement of artefacts from higher points, due to erosional processes.</p>
Scarred trees	<p>Scar trees may occur where native vegetation has been preserved. Large pockets of vegetation intersect with the Project area along with the identification of a previously identified site within 2 km of the Project area. Closer inspection would clarify if there were native mature trees with potential or younger regrowth or exotic trees that have no potential.</p>
Carved trees	<p>Carved trees may occur in association with burials, ceremonial sites or as indicators of ‘dreaming’ tracks and pathways. As such, they may occur only where native vegetation has been preserved, but their location within the landscape is difficult to predict without the aid of cultural knowledge.</p>
Grinding grooves and grind stones	<p>Grinding grooves on bedrock are unlikely to occur as the types of outcropping geology is probably unsuitable for grinding. However, outcropping of suitably fine-grained granite may have been used for grinding grooves. Furthermore, portable grinding grooves may occur in the landscape, most likely adjacent to watercourses and possibly part of larger open camp site assemblages.</p>
Hearths	<p>The extent of historical land use (primarily vegetation clearance due to extensive logging activities) has led to widespread disturbance, which is likely to have removed or destroyed archaeological traces of this site type. Soil landscapes information indicates that topsoils generally comprise shallow duplex soil profiles and therefore deeper stratified deposits suitable for the preservation of hearths are unlikely to exist.</p>
Burials	<p>Burials can occur anywhere in the landscape, but their identification is rare but have been recorded within 2 km of the Project area previously. Generally, they would be identified by mounds of earth, carved trees or stone markers. Theoretically they are more likely to occur in areas with cobble and small boulder rock outcrops such as crests and upper slopes.</p>
Stone arrangements	<p>Stone arrangements are most likely to occur on elevated and relatively flat landforms (e.g. crests, terraces, ridges) nearby sources of outcropping cobbles or small boulders capable of being moved manually. However, it is very likely that they have been disturbed and/or destroyed by historical land use practices. The areas most likely to feature suitable stones are outside the disturbance footprint along the plateau.</p>
Quarries (stone or ochre)	<p>Quarries of basalt, chert, jasper or volcanic derived tuffs have a moderate likelihood of occurring on the crests and upper slopes; however, this is outside the disturbance footprint but within the Project area.</p>
Rock art, shelters and engravings	<p>Rockshelters and/or rock art and engravings may occur in areas with large granite tors or overhangs along ridgelines. The identification of art is not unlikely given the close proximity of other rockshelter sites associated with ceremonial areas.</p>
Middens	<p>Middens of bone, charcoal, stone and freshwater shells may occur along extensive and reliable river systems. However, they have not been previously documented in the local landscape and are likely to have been disturbed or removed by historical land use. If present, they are most likely to occur in association with open camp sites.</p>

7 Field investigation

7.1 Key findings

- On-site validation consisted of field surveys and test excavations undertaken by EMM archaeologists and representatives of seven of the registered Aboriginal parties. The field investigations focussed on the construction envelope where access was readily available. The field survey encompassed a 5-week period in May and June 2022, while the test excavations consisted of a four-week program between August and September 2022. Some 76% of the proposed test excavations were completed, with parts of the EAR yet to be investigated due to poor weather conditions at the time of the ACHA. While the works to date provide a robust archaeological model for the construction envelope, the remaining excavations are proposed in early 2023 and form a recommendation of the report. The field activities completed ultimately totalled over 250 person days of investigation on-site.
- The field survey encompassed some 107 kilometres (or some 801 hectares) of linear pedestrian transects across the construction envelope and included 1,004 individual points of observation and documentation. Visibility and coverage were relatively poor (~13%) due to dense vegetation. Despite this, some 108 Aboriginal objects, sites and/or places were documented, and one previously documented site relocated. These included: 42 artefact scatters; 32 isolated stone artefacts, including one possible post-contact artefact; 24 potential culturally modified trees, including one associated with an artefact scatter and one associated with a potential gender-restricted (women) site; six stone arrangements, including one associated with a nearby artefact scatter; two potential quarry sites, including one associated with an artefact scatter; two potential rockshelter sites; and, one potential grinding groove site identified by Aboriginal participants. Of these sites, several (n=40) were identified as having only a tentative identification with further investigations needed to validate them as Aboriginal objects/sites.
- Test excavations consisted of 116 0.25 m² manually dug test pits in a systematic grid (400 x 50 m) focussing on the construction envelope running along the Macleay River and Georges Creek – a distance of ~ 16 km. These were predominantly within the spurcrests, spurslopes and hill slope landforms. Overall, some 2,462 artefacts were recovered primarily between 10–40 cm below surface, with 2,049 of these found at a single location near the proposed lower reservoir but outside the construction envelope, and likely reflecting exploitation of a quartz outcrop. Overall, some 21 test pits were shown to contain extrapolated values of ≥24 artefacts/m² and considered to reflect past foci of occupation and activity. They are all found within 360 m of the Macleay River, noting that this system can flood significant distances in some areas (and as such the distance may have been less). The findings appear to demonstrate exploitation of the raw materials near and within the nearby river systems (including hornfels, with silcrete, jasper, chert, and quartz) being taken to nearby elevated ground, minimally modified and then relocated elsewhere for subsequent use. With these exceptions, the assemblage reflects only an ephemeral or transient use of much of the river corridor. Foci of cultural material were generally 0.6 ha (80 x 80 m) in size, and characteristically appear to suggest use of the region over the last 5,000 or so years.

7.2 Archaeological survey

7.2.1 Approach and methods

EMM conducted an archaeological field survey of the construction envelope with the assistance of Aboriginal participants over a five week period (2 May and 10 June 2022). The survey was directed by Taylor Reid (EMM archaeologist), with the archaeological team consisting of Miles Robson and Georgia Burnett (EMM archaeologists). A number of Aboriginal organisations were represented (~7 sites officers per day representing six organisations and/or individuals) throughout the course of the program (Chapter 3); a list of groups present during the survey is presented in Table 7.1. Logistical support for the work was provided by OMPS team members and Cori Whipps (Pointe Engineering).

The primary aims of the survey were to:

- identify Aboriginal archaeological sites and/or Aboriginal places within the survey area and assess their significance with the assistance of Aboriginal participants
- characterise the landscape to aid predictions of archaeological potential
- identify sites or areas that would require further investigation if planned for development as part of the project
- identify sites or areas to be avoided by development, where possible
- identify areas with minor or negligible Aboriginal cultural heritage values that are most suitable for development.

The archaeological survey and data collection methods followed Section 2.2 of the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). To ensure full coverage of the proposed areas of (potential) impact were suitably surveyed, the survey targeted the construction envelope, and each transect aligned with discrete landforms where feasible. Each survey participant was spaced approximately 10 m apart for each transect, and where the terrain became inhospitable the team split into two smaller teams with one taking the higher, steeper points and the other covering the flats; ultimately this allowed for allowing survey of areas ~50–100 m in width. This method was considered suitable for the steep and undulating landscape within the construction envelope, and whereby suitable ground exposures were easy to identify and targeted. (The extremely steep sides of the valley in many areas were largely inaccessible by pedestrians without risk of injury). Due to poor visibility across the entire construction envelope the assessment calculations assume that each participant could identify and inspect exposures within 5–10 m either side of them. Notwithstanding, this calculation does not account for more obtrusive site types such as grinding grooves and culturally modified trees which are observable from a much greater distance.

The survey team targeted ground exposures along transects, outcropping bedrock, any overhangs, and other features where cultural material were predicted to occur (Section 6.6). It must, however, be noted that archaeological surveys are inherently limited by ground surface visibility conditions and therefore are considered to only *sample* the landscape. The archaeological survey did not aim to cover the entire ground surface within the project area, but rather to characterise the archaeological landscape through accessible portions of construction envelope.

The effectiveness of the survey is determined through recording and analysing survey coverage data. It is evaluated for its effectiveness in identifying the distribution of Aboriginal objects across the landscape, consideration the potential for archaeological deposits. The percentage of the ground surface exposed in each landform and the visible ground surface within exposures (as ground exposures are often obscured by vegetation, gravels, etc.) influences the survey results. For example, an archaeologically sensitive landform surface that is highly exposed by erosion is likely to reveal Aboriginal objects, whereas a similar landform that is thickly grassed will obscure surface artefacts if they are present. Overall, calculation of effective survey coverage is used to estimate not only how much area was physically surveyed, but also how favourable the survey conditions were for the identification of Aboriginal sites.

Site recording was completed in accordance with the *Code of Practise for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). Site locations and their details were recorded with digital tablets using site recording forms created by EMM on the Survey123 application for ArcGIS (Esri© software). The digital tablets had a location accuracy of up to ± 3 m which is similar to hand-held non-differential GPS units (~ 5 m). The Survey123 forms allowed for a site’s location, details and representative photographs to be linked together, which avoided potential post-fieldwork issues around data integrity.

Survey transects were recorded as tracks on GPS units and detailed information about each transect recorded on a separate Survey123 form created by EMM. The Survey123 form allowed for survey transects starting points, details and representative photographs to be recorded. The course of survey transects were recorded as tracks on hand-held non-differential GPS units which were linked to the Survey123 forms.

Table 7.1 Aboriginal stakeholder representatives present during the survey

Organisation	Representatives
Thunggutti Local Aboriginal Land Council	Lachlan King Lila Quinlan Lyle Quinlan Tiara Hampton Allidia Walker Kenneth Major
Three Ducks Dreaming	Lenny Wright Uncle James Dunn
Bruce Cohen	Bruce Cohen Terrance Cohen
Iwatta Aboriginal Corporation	Steve Ahoy Michael Moree
Gumaraa Aboriginal Experience Pty Ltd	Richard Callaghan Glen Campbell
QMS	Richard Campbell Colleen Campbell

7.2.2 Results

Overall the survey encompassed 40 discrete transects, extending ~107 km in length and encompassing ~801 hectares of observation across the project area, with a focus on the construction envelope (Plate 7.1 - Plate 7.11; Figure 7.1, Figure 7.2; Table 7.2; Attachment F.1). The transects were on average ~2.7 km in length, ranging between ~980 m up to ~9.4 km. Some 1,00 discrete observations of the project area were documented (Figure 7.1; Attachment F.3). All parts of the surveyed area (which broadly correlates with a proposed construction envelope) were investigated, with the exception of a small portion of the proposed EAR within the flood zone, which was not accessible due to high waters in the Macleay River at the time of the field program. Across the construction envelope, exposure was ~60% (reflecting the high proportion of access tracks traversed), visibility was ~16% and effective coverage ~11%. A summary of each transect is provided in Attachment F.1 and a full photographic catalogue is provided in Attachment F.3.

Topographically, the construction envelope is dominated by moderate to extremely steep, heavily vegetated relief situated on the eastern bank of the Macleay River. The terrain is rugged, steep and undulating, punctuated by steep spurs and deeply incised drainage lines. To give an indication of this terrain, elevation grade between the proposed upper and lower reservoir is $\geq 50^\circ$ (with slopes of up to 89° recorded in some sections) and walking between the two reservoir sites requires ~6 hours despite being only ~1 km apart. Notably, as the Macleay flows east towards Bellbrook, and the terrain becomes less rugged, much of the eastern portion of the EAR is characterised by flat grassy terraces adjacent the river. The remaining portion of the construction envelope – in the vicinity of the upper reservoir – is situated on the Carrai Plateau, a flat to gently undulating plateau that drops steeply and dramatically into the Macleay River valley to the west.

The other major named watercourse in the vicinity of the construction envelope, is Georges Creek, which meets the Macleay River at Georges Junction, located on the central western edge of the project area. Due to unprecedented rains, many of the lower order streams mapped within the project area and surrounding locale were flowing at the time of survey. However, given the steep topography, it is also likely that many of these are only ephemeral, carrying flow only occasionally after heavy rain. Compared to the immediate vicinity of the nearby Macleay River, a more substantial waterway with a wide and relatively flat floodplain in many parts, these lower order waterways are therefore unlikely to have been a focus of past by Aboriginal people. Although, numerous sites were found at the confluence of these smaller creeks and the larger tributaries, suggesting parts of them may have been utilised in the past.

The observed soil profiles are more extensively described by the test excavations (Section 7.3), however as predicted in Section 4.6, were all generally shallow where observed across the project area. On the steeper slopes, geological outcrops were frequently present and/or observed beneath a shallow topsoil unit – likely of recent development. Along the proposed lower reservoir area and associated access, some potential for deeper soil profiles were observed, associated with colluvial processed bringing sediment downslope. Where observed, these soils tended to be pale and extremely coarse sands with frequent small gravel inclusions.

On the flatter, broad terraces associated with the eastern end of the EAR, there was some variability, but in general soil profiles were found to be a ≤ 1 m soil profile composed of a ~40–50 cm topsoil unit (pale brown loamy sand) situated on varying sandy clay units (B2 horizon) where vertical sections were observed. Vegetation in the Project area predominantly comprises young native eucalypt forest on hillslopes, and native grasses on the alluvial terraces, with occasional old river gums and other eucalypts in the river corridor. Much of the vegetation within the construction envelope appeared generally as regrowth and aligned with the cedar felling documented in the 19th Century.

Notably, at the time of survey, the catchment within which the project area sits at times experienced unprecedented rain events. During this period, the Macleay River experienced several high-energy, major (>10 m) prolonged and/or flash flooding events. In several locations, the effects of these flood events were observed in localised scouring of alluvial banks and the displacement of vegetation along the river corridor. In a number of locations, the effects of the flood could be observed several hundred meters from the river's edge.

The field investigation identified 108 previously undocumented Aboriginal objects and/or sites (Section 7.2.3; Table 7.2; Figure 7.2; Attachment F.2) and re-identified one previously documented site (AHIMS #21-5-0142). An attempt was made to relocate AHIMS #21-5-0011, however near vertical terrain in this locale made the attempt unsuccessful. These sites were primarily found on hillslopes (n=29, 27%), which likely is more reflective of the abundance of this landform within the surveyed area rather than any distinctive site patterning (Table 7.2). Notably, hillslopes reflect 75% of the area effectively surveyed during the fieldwork. Comparatively, while terrace landforms represent <1% of the area effectively surveyed, 15% (n=16) of sites were identified on this landform type. Similarly, spurcrests represent <1% of the area effectively surveyed, with 15% (n=16) of sites were identified on this landform. This is most evident in the site density calculations provided in Table 7.2, which shows that 1 site per 2–5 ha may be expected in terraces, spurcrests and spur slopes compared with 1 site per 8–12 ha in hillcrests or slopes.

Table 7.2 Summary of the field survey, showing landforms inspected, visibility and coverage, and number of Aboriginal sites (re)identified

Landform	Landform area (m ²)	Area effectively surveyed (m ²)	% of landform effectively surveyed	% of total area effectively surveyed	Number of sites identified	Site density by landform area (1 site/x ha)
Creekline	761,150	85,479	11	7	9	8.46
Hillcrest	242,550	41,152	17	3	3	8.09
Hillslope	3,764,800	894,379	24	75	29	12.98
Plateau	935,100	46,755	5	4	11	8.50
Ridge	680,800	51,215	8	4	14	4.86
Spurcrest	607,100	13,480	2	1	16	3.79
Spurslope	553,650	54,801	10	5	11	5.03
Terrace	465,600	6,984	2	1	16	2.91
Total	8,010,750	1,194,244			109	
<i>Average</i>	<i>1,001,344</i>	<i>149,280</i>	<i>15</i>	<i>13</i>		<i>6.89</i>



Plate 7.1 Composite imagery of the southern portion of the Project area, showing the steep relief from the Carrai Plateau (right) into the Macleay valley (left), view north. For location reference, the blue arrow indicates the approximate location of the East Kunderang homestead site



Plate 7.2 Drone imagery of the Project area, showing the river valley, view north. The blue arrow shows the approximate location of the proposed lower reservoir



Plate 7.3 The flat alluvial terraces of George's Junction camping ground, view south



Plate 7.4 Example of the access track that runs broadly parallel with the Macleay River, view east. As demonstrated, the access track has been cut into the hillslope, and recently graded



Plate 7.5 Example of the flat terrace landform that characterises the eastern portion of the EAR, view east. Visibility here was poor due to tall grasses



Plate 7.6 Example of disused access track that characterises the surveyed area in the northern portion of the Project area. The track runs along the ridgeline, and slopes steeply either side



Plate 7.7 Example of a relatively wide, flat spurcrest of the Project area, view east



Plate 7.8 Example of a steep, rocky hillslope landform which dominates the landscape, view west



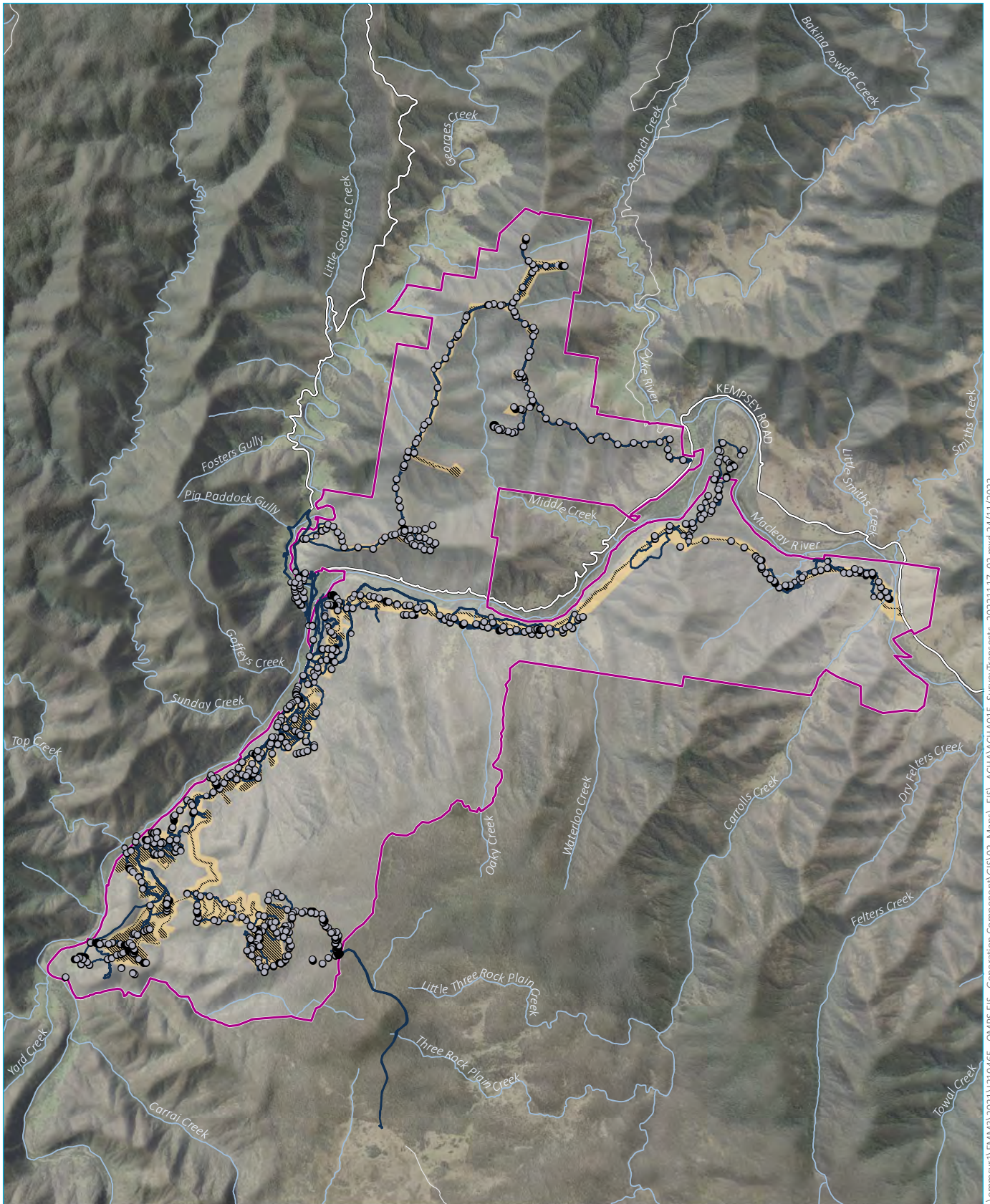
Plate 7.9 Example of high energy flood damage observed in various areas across the Project area, view south east



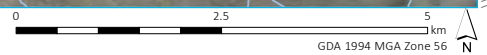
Plate 7.10 View of the Carrai Plateau (background) from steeply sloped ridgeline leading down to the Macleay River valley, view north



Plate 7.11 Example of the relatively flat topography of the Carrai Plateau, view north. The plateau is relatively flat, until it drops steeply into the Macleay River valley to the west



Source: EMM (2022); DFSI (2020, 2021); DPI (2015); GA (2011, 2020)



KEY

- Project area
- Disturbance footprint
- Construction envelope
- Survey documentation point
- Survey track
- Existing environment
- Major road
- Minor road
- Named watercourse

Survey transects

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 7.1



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7.2.3 Aboriginal sites identified

The field investigation identified 108 previously undocumented Aboriginal sites, and re-identified one previously recorded site (Figure 7.2; Plate 7.12–Plate 7.21; Attachment F.2 and F.3). These included: 42 artefact scatters; 32 isolated stone artefacts, including one possible post-contact artefact; 24 potential culturally modified trees, including one associated with an artefact scatter and one associated with a potential gender-restricted site; six stone arrangements, including one associated with a nearby artefact scatter; two potential quarry sites, including one associated with an artefact scatter; two potential rockshelter sites; and, one potential grinding groove site identified by Aboriginal participants.

Sites were most commonly identified on terrace landforms (one site per 2.91 ha), followed closely by spurcrest landforms (one site per 3.79 ha) (Table 7.2). While hillslope landforms represent 75% of the area effectively surveyed (Table 7.2), sites were identified on this landform with the lowest frequency (one site per 12.98 ha); and which suggests that the high number of sites identified on this landform (n=29) is inflated by the steep, rugged terrain of the Project area, rather than necessarily past Aboriginal activities. As predicted by previous studies in the region, the majority of identified sites consisted of stone artefact materials (n=74, 68%). On average, artefact scatters identified during the survey were relatively large (\bar{x} =0.6ha, or ~80 x 80 m) and of very low density (\bar{x} =0.07 artefacts/m²). Artefact sites, both isolated finds and scatters, were most frequently identified on spurcrests (one site per 3.79 ha) and terrace landforms (one site per 2.91 ha). Raw materials identified during the survey were primarily hornfels, with silcrete, jasper, chert, and quartz also present in lower numbers. The high number of isolated finds identified on hillslope landforms (n=10) is likely the result of downward movement of sites from spurs and crests, where high levels of erosion were observed. However, artefacts, isolated and scatters, were identified on all landforms surveyed.

In the case of the non-artefactual sites, the potential culturally modified trees were typically associated with terrace (n=6) and hillslope (n=6) landforms. Notably, a number of potential, culturally modified trees were identified on the ridgelines in the mountains in the northern portion of the Project area (n=6), which is an uncommon location for this site type (see Section 6.4). In addition, one tree was identified by Aboriginal participants as a possible gender-restricted (women) site, based on the tree species, but exhibited no other modifications. (This site has been identified as a cultural site in this report). Four of the six stone arrangements identified were identified on ridges and spurcrests, with two identified on terrace and hillslopes. The two potential quarry sites and potential grinding groove site were identified on exposed volcanic rock that forms the underlying geology of the streambed.

However, of the remaining tentative sites, several are recommended for further specialist investigations (Chapter 11), since they exhibit limited evidence within the regional or local context, nor exhibit distinct archaeological characteristics. These include several of the culturally modified trees, stone arrangement sites, quarry sites, and the grinding groove site. Many of the identified culturally modified trees exhibited few definitive features (such as a symmetrical oval scar or tool marks) that would robustly determine their cultural origins. The age of the trees must also be questioned, with the logging being a significant European industry in the post-Contact period (Section 4.9 and Chapter 5). Such sites are now commonly investigated by an arboriculturist with Aboriginal participants to further explore their identification. As discussed in Chapter 6, a number of the stone arrangements have limited contextual evidence, and often lack form or patterns typically associated with stone arrangements (e.g. OMPS-SA2 – 6) (see Appendix D) and may in fact be more recent cairns or markers from hikers or travellers using the National Trail that many of them align with. Regarding the quarry sites, OMPS-Q1 was associated with a nearby artefact scatter that included high numbers of the same raw material (likely hornfels). In contrast, OMPS-Q2 appeared to lack any surrounding artefactual material and had few indications of anthropogenic modification. Given the high energy environment it was found within, a natural formation is a distinct possibility. In the case of grinding grooves, more commonly they are found in sandstone geology, which is not present within the construction envelope; and are sparse across the New England region (Section 6.4). As such, several of these sites are identified as a 'tentative' identification, with recommendations for further investigation where they may be affected by the project.



Plate 7.12 AHIMS 21-5-0142, a large artefact scatter identified on a long, relatively flat spurcrest, view south west



Plate 7.13 A possible anvil at AHIMS 21-5-0142



Plate 7.14 Example of artefacts identified on a river terrace abutting the Macleay (OMPS-AS26), view north



Plate 7.15 Dark green quartzite artefact (part of OMPS-AS06), identified as a material common in south Sydney assemblages by Lenny Wright (Three Ducks Dreaming)



Plate 7.16 Example of hornfels artefact (OMPS-IF11), which was the most common raw material identified during the survey



Plate 7.17 Sample of flakes identified on an access track (OMPS-AS39). Raw materials include quartz, jasper and hornfels



Plate 7.18 A potential quarry site (OMPS-Q1), view southeast. Artefacts were also identified on the terrace left of frame



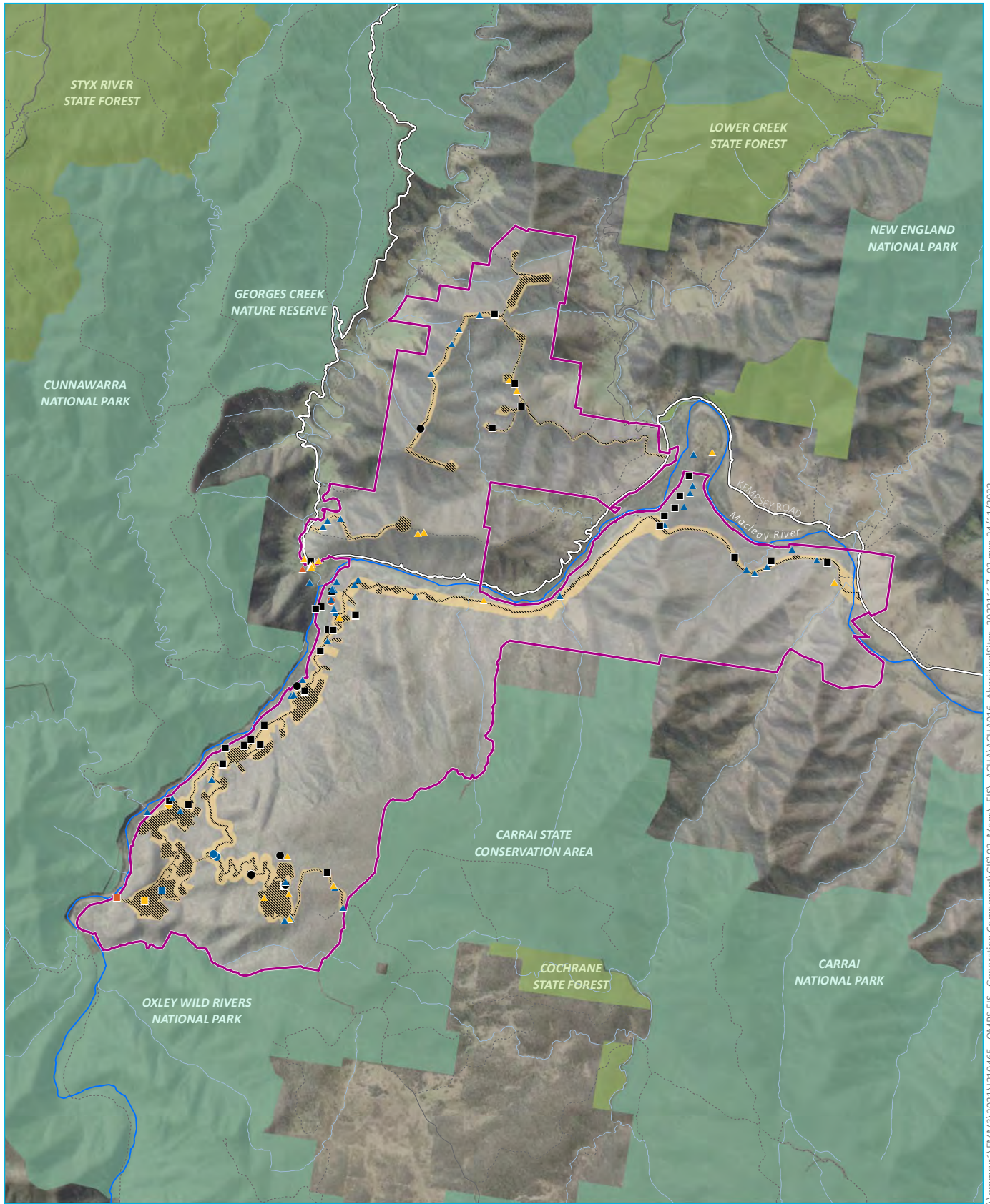
Plate 7.19 A potential stone arrangement identified by RAP participants (OMPS-SA1), view west



Plate 7.20 Potential culturally modified tree on banks of Macleay River (OMPS-ST2)



Plate 7.21 Potential rockshelter, made by boulder overhangs, identified on very steep slopes dropping off the Carrai Plateau (OMPS-R1)



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

- KEY**
- Project area
 - Disturbance footprint
 - Construction envelope
 - Existing environment
 - Macleay River
 - Watercourse/drainage line
 - Major road
 - Minor road
 - Vehicular track

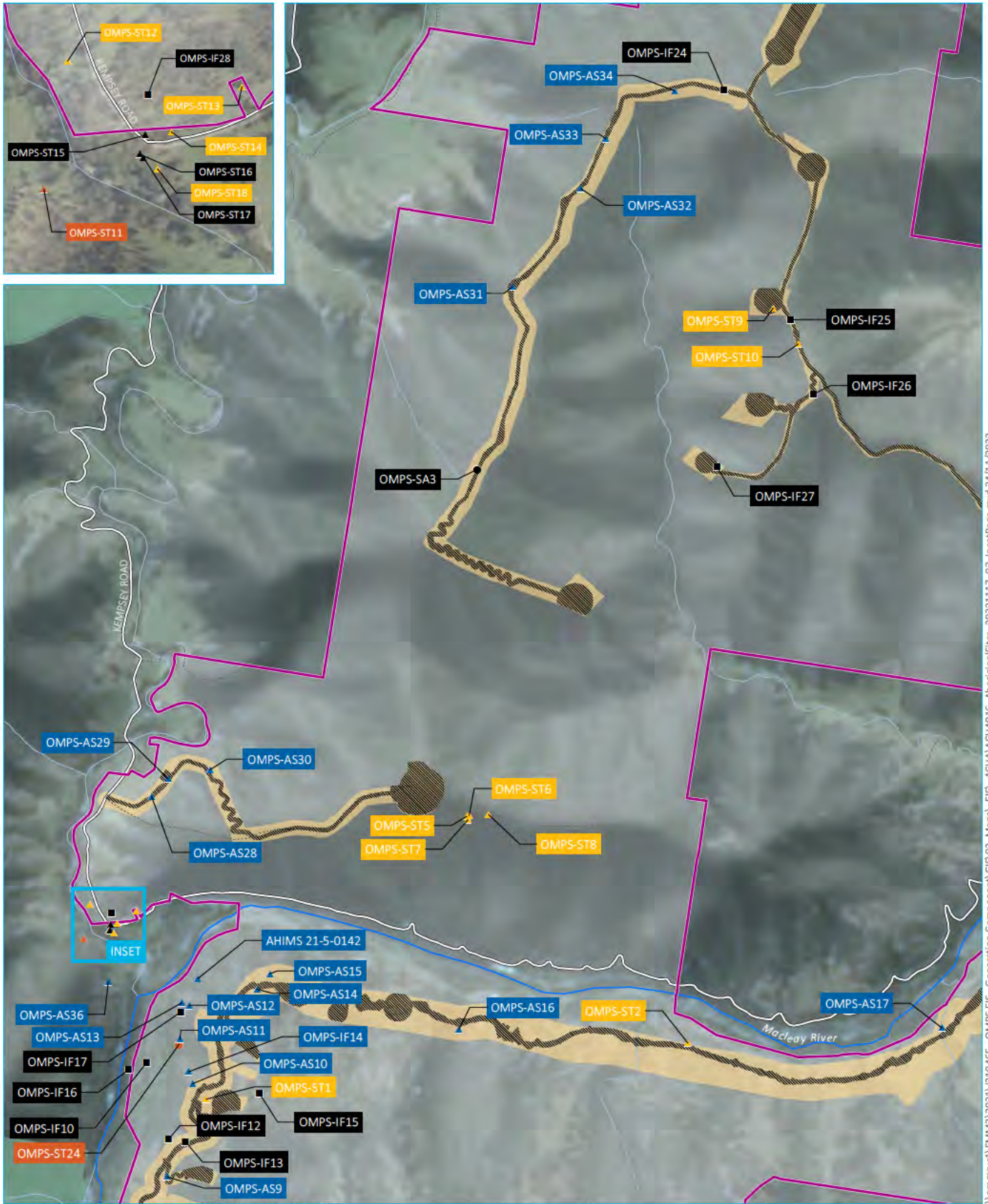
- NPWS reserve
- State forest

Identified Aboriginal sites
Map 1 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.2



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- Project area
- Disturbance footprint
- Construction envelope
- Existing environment
- Macleay River
- Watercourse/drainage line
- Major road
- Vehicular track
- NPWS reserve

- Sites types identified**
- ▲ Artefact scatter
 - ▲ Contemporary culturally modified tree
 - ▲ Culturally modified tree
 - ▲ Culturally modified tree, artefact scatter
 - Isolated artefact
 - Stone arrangement

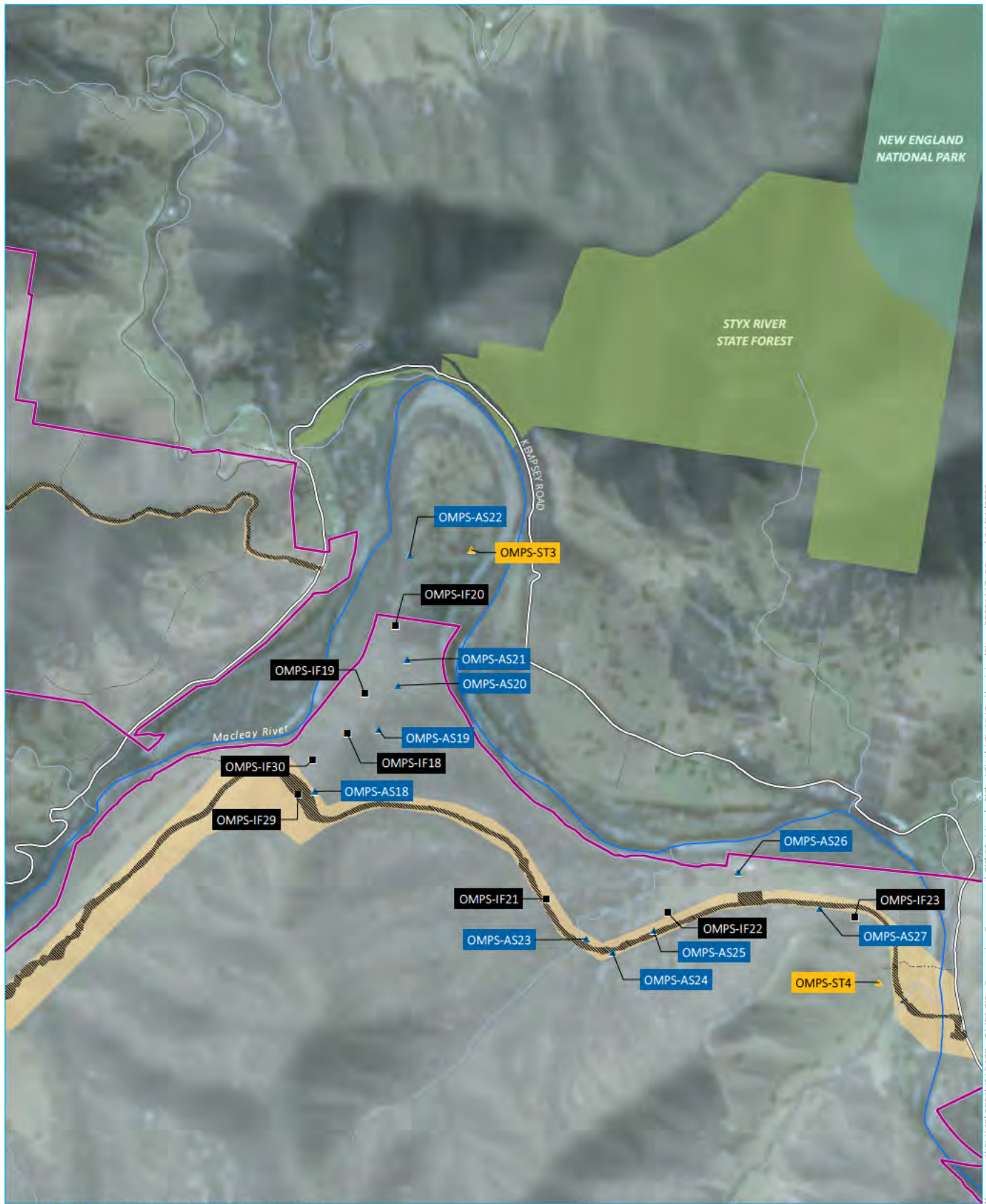
- Culturally modified tree, potential gender restricted site

Identified Aboriginal sites
Map 2 of 4

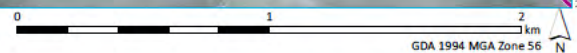
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.2



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

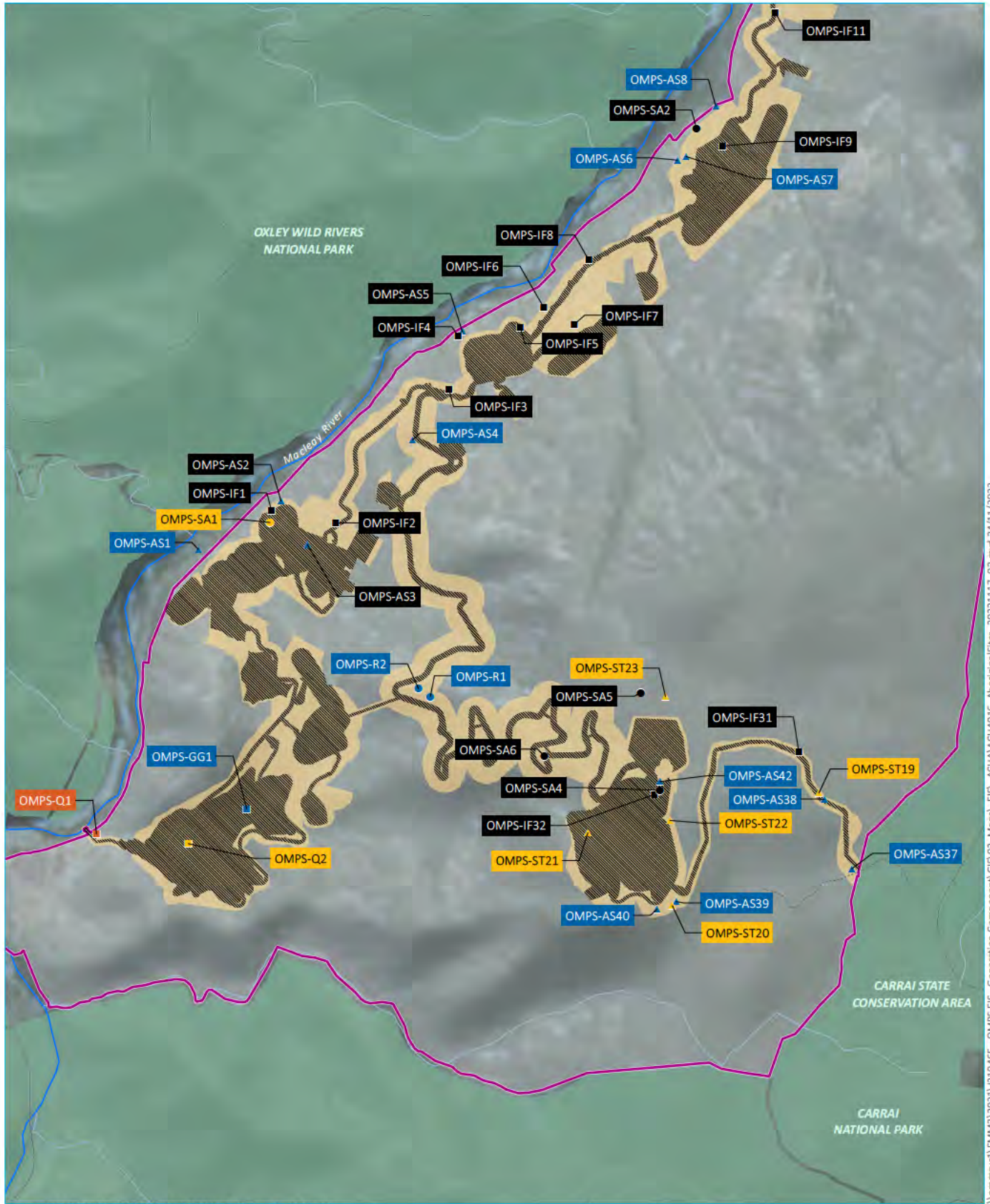
- | | |
|---------------------------|-------------------------------|
| Project area | NPWS reserve |
| Disturbance footprint | State forest |
| Construction envelope | Sites types identified |
| Existing environment | Artefact scatter |
| Macleay River | Culturally modified tree |
| Watercourse/drainage line | Isolated artefact |
| Major road | |
| Minor road | |
| Vehicular track | |

Identified Aboriginal sites
Map 3 of 4

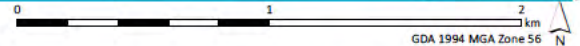
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.2



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> Project area Disturbance footprint Construction envelope Existing environment Macleay River Watercourse/drainage line Vehicular track NPWS reserve | <p>Sites types identified</p> <ul style="list-style-type: none"> Artefact scatter Culturally modified tree Grinding grooves Isolated artefact Quarry Quarry, artefact scatter Rockshelter Stone arrangement | <ul style="list-style-type: none"> Stone arrangement, artefact scatter |
|--|---|--|

**Identified Aboriginal sites
Map 4 of 4**

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.2



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7.3 Test excavations

7.3.1 Approach and methods

EMM facilitated an archaeological test excavation of the construction envelope, with the assistance of Aboriginal participants over a four-week period (12 September to 7 October 2022). These works were undertaken in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010) and consisted of small manually dug test pits in transects across the construction envelope. The excavation was directed by Niche Environment and Heritage Pty Limited (as a sub-contractor to EMM), and a number of Aboriginal organisations were represented throughout the course of the excavation program; a list of groups present during the test excavations is presented in Table 7.3.

The primary aims of the excavations were to:

- Identify, map and characterise the nature, age, extent, integrity and significance of the Aboriginal cultural material within the project area.
- Collect data to answer the following research questions:
 - What are the environmental characteristics associated with the distribution of Aboriginal cultural heritage within the Project area?
 - Can the formative processes of the stratigraphic profile provide information on the nature and/or survivability of the archaeological resources?
 - Are there other key factors in the distribution and extent of the material culture within the project area (e.g. how construction of the dam will potentially affect these deposits)?
 - What are the cultural, social and public values associated with the Aboriginal archaeological resource within the Project area?
 - How should the Aboriginal sites in the region be conserved and managed in future?
- Better assess the significance and historical meaning of the cultural materials that exist within the project area so that future archaeological investigation can advance our understanding of past Aboriginal cultural behaviour and environmental adaptation.
- Direct future heritage activities and mitigation measures (if required) for the Project disturbance footprint.

To achieve these aims, a series of transects were proposed to extend across the construction envelope (Figure 7.1). Their focus was as a result of many of the identified Aboriginal sites being situated along the Macleay River corridor, the regional information (Chapter 6) and as the locations where the greatest potential impact would occur from the project. To ensure sample coverage of the whole construction envelope, these transects were spaced 400 m apart, with test pits spaced every 50 m along each transect. The length of the transects varied, with the longest – located near the lower reservoir – being 1.2 km (24 test pits) and the shortest – along the proposed EAR being 50 m (two test pits). The average length of each transect proposed was 300 m (seven test pits).

These initially encompassed all landform types and areas within the construction envelope, but following the field survey, input from Heritage NSW, and subsequent access issues (associated primarily with wet weather exacerbating safety concerns for the field team following rain), the transects were modified (Figure 7.3 and Figure 7.4); and ultimately focussed on the elevated landforms (mainly spurs and crests) overlooking the Macleay River. The modifications to the test excavation program occurred throughout September to October 2022 and were undertaken in discussion with the Aboriginal participants and Heritage NSW. Ultimately, the excavations consisted of a series of regularly spaced transects (typically 400 m) across the construction envelope.

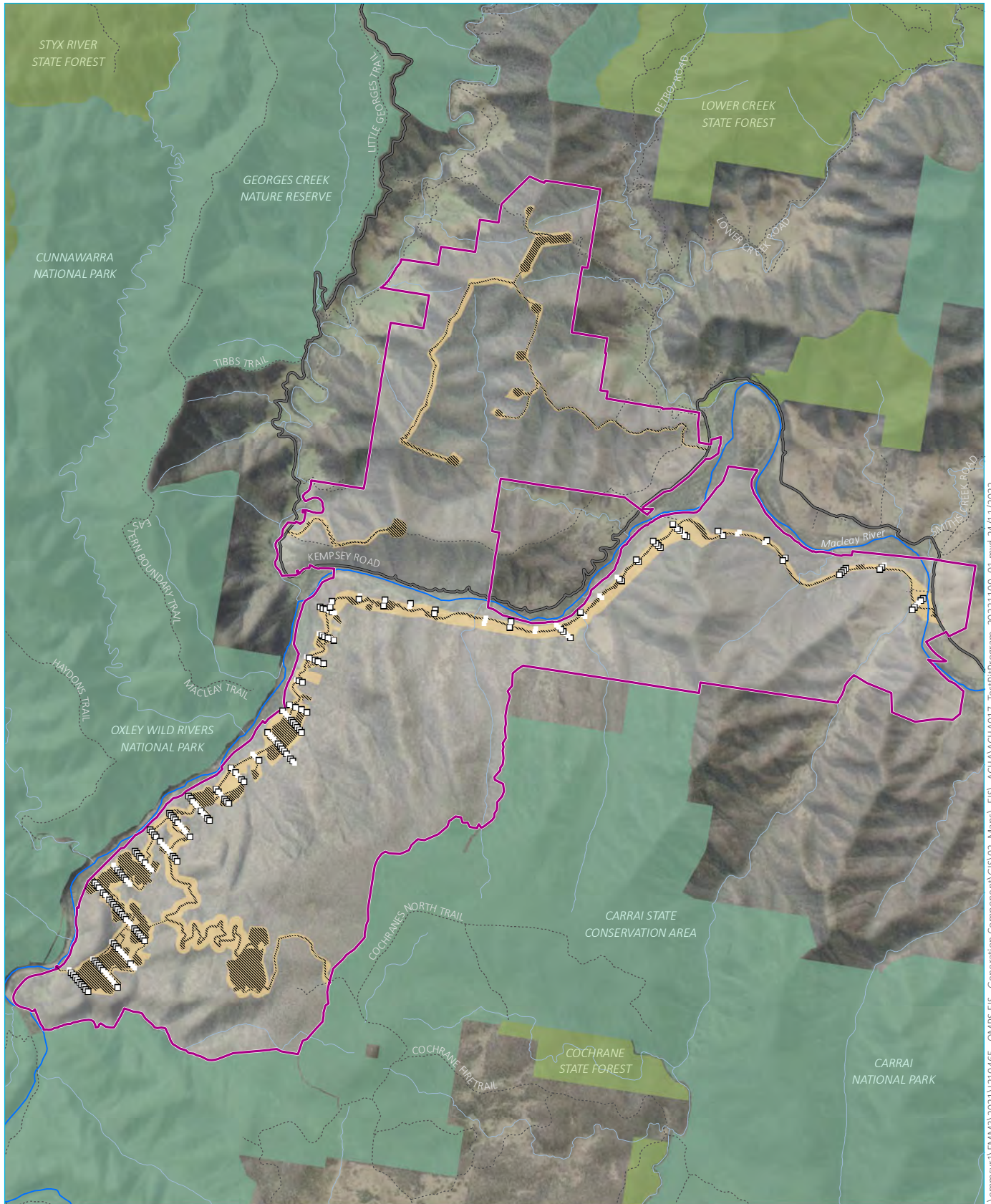
Due to the poor weather conditions, the test excavation program as proposed (Figure 7.3) could not be completed in the planned time available. Ultimately, about 76% of the test excavation program was completed (Figure 7.4). The excavations completed achieved many of the aims outlined above and provides a robust understanding of cultural materials across the construction envelope. Overall, some 192 test pits of the proposed program were either completed or discounted due to localised conditions (usually extremely steep terrain). Those completed encompass many of the largest areas of the proposed impacts of the Project, including the lower reservoir, construction camp, and surrounding infrastructure; and they provide further characterisation of one of the most significant sites, AHIMS #21-5-0142 (and demonstrate it would not be directly affected by the Project). Only a small portion of the EAR was, however, investigated, and the alluvial flats of the Macleay River in the survey area were not reached. Thus, the subsurface potential of terrace landforms (n=2, 2%) remain poorly explored to date. In discussions with Heritage NSW and the Aboriginal participants (Section 3), OMPS has committed to completing the test excavation program in early 2023 and would ensure this model continues to be refined to incorporate these areas.

Archaeological test excavations were implemented in accordance with Requirements 16 and 17 of the *Code of Practice for the Investigation of Aboriginal Objects in NSW* (DECCW 2010). In summary, the following methods were adopted for the excavation:

- all test excavation pits were spatially located using a differential GPS device
- manual excavation of 0.25 m² test pits in evenly spaced transects across areas of archaeological interest within the construction envelope
- all excavation used hand tools, such as shovels, mattocks and trowels
- excavation of the first unit was in 5 cm spits, with subsequent excavation in 10 cm spits
- manual excavation continued to either: i) the base of the cultural deposits; ii) to the depth of the underlying geology; or iii) to the maximum depth possible via hand excavation (~1–1.5 m)
- dry sieving of all manually excavated material through a 5 mm sieve
- soil profiles were recorded in accordance with the Code of Practice, including scaled drawings, photographs, and written descriptions
- soil samples were collected for description, sedimentological and chronological analysis where such analysis was considered likely to contribute significant information.

Table 7.3 Aboriginal stakeholder representatives present during the excavation

Organisation	Representatives
Thunggutti Local Aboriginal Land Council	Lachlan King
Three Ducks Dreaming	Lenny Wright James Dunn Chris Dunn
Bruce Cohen	Bruce Cohen Sonnii Dunn Michael Moran
Iwatta Aboriginal Corporation	Blear Ahoy
Gumaraa Aboriginal Experience Pty Ltd	Julia Ann Narayun
QMS	Richard Campbell Glen Campbell



Source: EMM (2022); DFSI (2017); GA (2011); SMEC (2022)

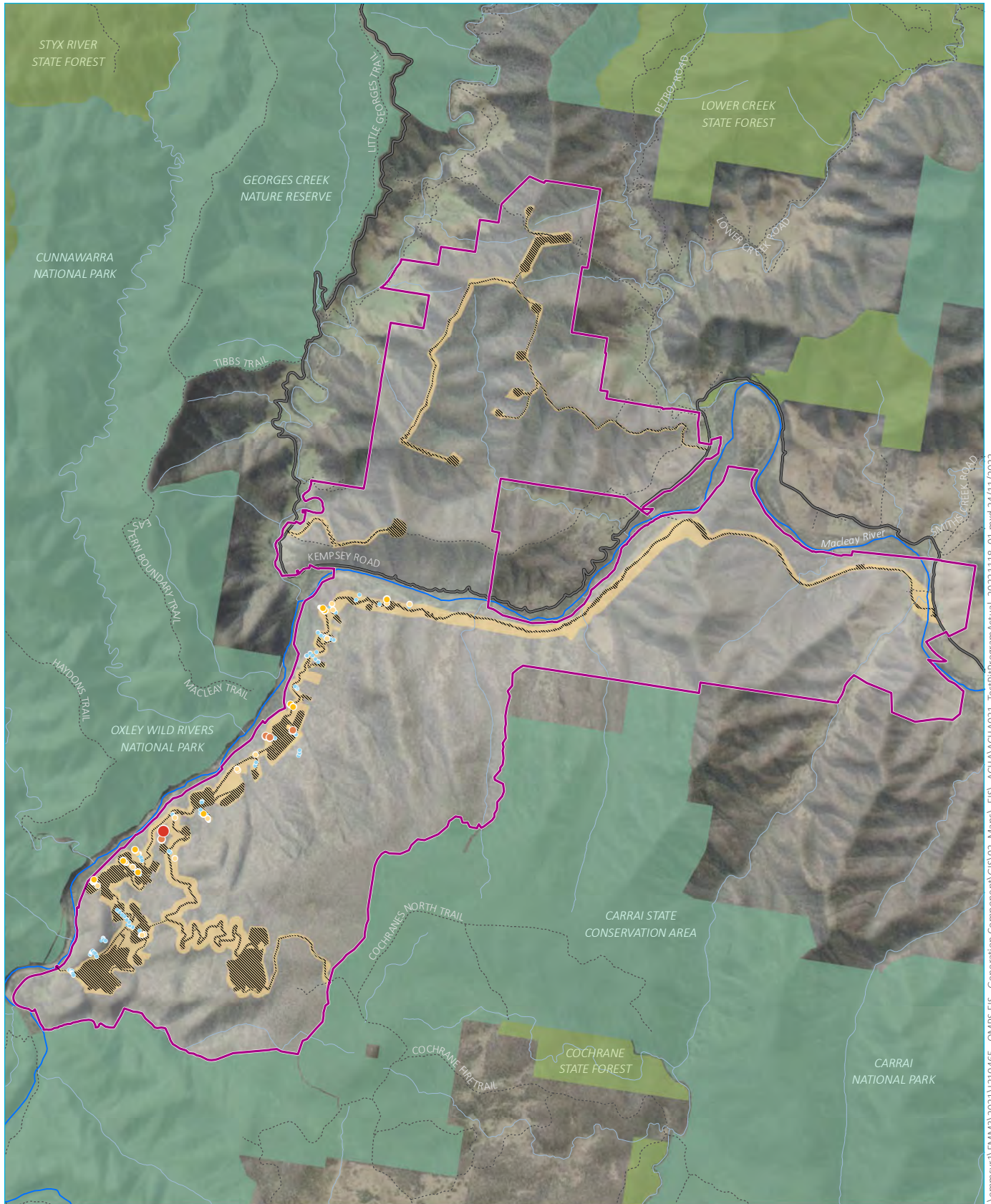
KEY

- | | |
|-----------------------|---------------------------|
| Project area | Existing environment |
| Disturbance footprint | Road |
| Construction envelope | Track |
| Planned test pit | Macleay River |
| | Watercourse/drainage line |
| | NPWS reserve |
| | State forest |

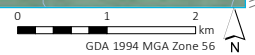
Test pit program

Owen Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 7.3

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Source: EMM (2022); DFSI (2017); GA (2011); SMEC (2022)



KEY

- | | |
|-------------------------|---------------------------|
| Project area | Existing environment |
| Disturbance footprint | Road |
| Construction envelope | Track |
| Number of artefacts (n) | Macleay River |
| None | Watercourse/drainage line |
| 1 - 40 | NPWS reserve |
| 40 - 100 | State forest |
| 100 - 400 | |
| 400+ | |

Test pit program (actual)

Owen Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 7.4



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7.3.2 Results

This section provides a summary of the excavations and subsequent analysis (Plate 7.22–Plate 7.23, Figure 7.5), with further detail provided in Attachment F. This includes a full catalogue of the excavated test pits (Attachment F.4) photographic catalogue of the excavated test pits (Attachment F.5) and detailed lithic analysis (Attachment F.6). A summary of the post excavation analysis, including stratigraphy, chronology and lithics analysis, from the excavations is provided below.

Overall, some 116 off 0.25 m² test pits were excavated across the spurs and slopes abutting the eastern bank of the Macleay River (Attachment F.4; Figure 7.5). A further 75 test pits were discounted due to being situated in extremely steep or other unsuitable terrain away from the river's edge. Test pits averaged depths of ~40 cm, but with a number extending up to 80 cm below the surface. A total of 116 pits were excavated from which 11.38 m³ of sediment was recovered and dry-sieved. Spatially, these test pits were predominantly on spurcrests (n=57, 49%), with some exploration of hillslopes (n=30, 26%), and spurslopes (n=23, 20%). Only two test pits were undertaken within terraces.

Only 38 of the 116 test pits (33%) contained artefacts (Figure 7.4), with a total of 2,462 Aboriginal objects recovered (Attachment F.4). When extrapolating each 0.25 m² test pit to 1 m², which is more commonly how artefact densities are discussed in the archaeological literature, an extrapolated average density of 84.9/m² was found across the construction envelope. However, a single test pit (T7P1) located outside the construction envelope included 2,049 (82%) of the recovered artefacts (discussed in detail in Section 7.3.2.ii). When removing these values, reduces the average to ~3.9/m² (or extrapolated average to a value of ~16/m²), which may be more accurate for much of the construction envelope. This value can be considered to reflect a background scatter indicative of the base-line levels for the past ephemeral use of the valley system over time (including, potentially, the post-Contact period).

A number of test pits (n=21, 18%) were found to contain >24 artefacts/m², a density that is considered to reflect past foci of activity in contrast to the broader background scatter. These high-density foci averaged ~360 m from the river's edge. This is further away from water than typical regional models indicate (~200 m), however this is likely owing to the wide, highly active river corridor of the Macleay River, which is >500 m in width in some areas in; and in part reflects the nearest spurcrests or elevated areas in the vicinity of the Macleay River. Due to constraints identified above which limited the excavation program, the priority was coverage of the construction envelope and additional test pits could not be excavated to explore the size of these foci, however they are generally on smaller landforms (such as a specific spur or hill crest); and based on the field survey, are considered to be ~0.6 ha in size. Further refinement of these zones is proposed in subsequent excavation programs.

Cultural material was recovered from all excavated depths, but significantly dropped below 40 cm. The majority of the assemblage was recovered between 10 cm and 50 cm below surface, with peaks at both 10–20 cm and 30–40 cm below surface. Analysis of the cultural assemblage suggests that it dates to mid to late Holocene (i.e. <5,000 years ago). Characteristics of the assemblage suggest that T7P1 and several of the other foci reflect exploitation of raw materials either adjacent to, or coming from (e.g. river cobbles), the Macleay River and Georges Creek. Notably, T7P1 is in the vicinity of a previously documented increase site found within the Macleay River in this locale (Chapter 6). However, the majority of the findings are more characteristic of transient and ephemeral movement along the Macleay River and Georges Creek corridors in the last few thousand years.

While the test excavations remain incomplete, it is considered that the findings of the additional 60 or so test pits would not fundamentally change these interpretations. It is probable that they would continue to recover low densities of cultural materials intermixed with occasional activity foci. Further, the proposed works along the EAR – the only area where works remain incomplete – are constrained to a narrow access track, some 10 m in width, and as such, there would be opportunity for minor re-design in the event that the remaining excavations identify any highly significant cultural materials. Given the current stage of the design, such minor changes are readily achievable. This is discussed further in Chapter 11.



Plate 7.22 Landscape context of T7P1, situated on a sloped spurcrest, view north



Plate 7.23 Stratigraphy of T7P1, north section

i Stratigraphy

The soil profiles across the 116 test pits were generally consistent and can be described as one of two different types. These included:

- on spurcrests, spurslopes and hill slopes (Plate 7.4):
 - at the surface, a dark brown loam to sandy loam with frequent roots, rootlets and gravels (A1 horizon), averaging ~20 cm
 - underlying (i), a orange brown loamy coarse sand, with frequent medium to course volcanic gravels and some charcoal flecking, averaging ~25 cm deposit in thickness (A2 or upper B2 horizon)
 - underlying (ii), a dark medium orange yellow clay and/or degraded volcanic bedrock, and encountered at ≥ 40 cm below ground surface (B2 and/or C horizon)
 - occasionally, bedrock was already exposed prior to excavation, and (i) and (ii) simply reflected a recent formation of soil from underlying weathered bedrock
- on terraces:
 - within active river course, a very coarse, dark brown loamy sand with frequent inclusions predominantly in the form of loose river cobbles (modern alluvium/A1 horizon).

The first soil profile is consistent with residual skeletal soils commonly found on steep slopes and crests, where the lack of vegetation and high erodibility inhibits more extensive formation. Given the steep relief and high energy environment, especially flooding, it is considered that the upper units are recently formed, and subject to regular erosion and movement. The under-lying (ii) and (iii) are more consistent with the diagenesis of the underlying bedrock and consist of a more stable portion of the soil profile but were often found to be culturally sterile.

The second soil profile is consistent with a recent alluvium that has been deposited during flood and high water levels. The shallow topsoil has formed following the formation of the alluvium and is similarly potentially only decades old. Any artefactual material in this unit has likely either i) been recently deposited, and/or ii) eroded from upslope.



Plate 7.24 Stratigraphy of T5P1, which shows the typical soil profile on spurcrests, spurslopes and hill slopes

ii Lithics

Analysis of the stone artefacts recovered by the test excavations was undertaken by Dr Trudy Doelman, University of Sydney, and the full report is presented in Attachment F.6. A summary is provided below.

Overall, 2,462 lithics were recovered during archaeological excavations, representing an extrapolated average artefact density of 84.9 lithics/m² (Figure 7.6; Plate 7.25–Plate 7.27).⁴ This average is inflated by cultural material recovered from T7P1 (n=2,014); artefacts recovered from this test pit represent 82% of the total excavated assemblage and an overall extrapolated artefact density of 8,056/m². When T7P1 is excluded from the data, the results are more in line with other regional studies, and across the construction envelope values of 3.5/0.25m² (or ~14/m²) are more observed. Several test pits (n=20) return extrapolated values of 20–30/m². Overall, these values reflect a general low-density background of cultural material across the construction envelope with discrete foci of occupation and activity. Given the dominance of T7P1 in this data, discussion of this site will be undertaken separately below.

⁴ As outlined previously, while all excavations were 0.25m² in size, typically data are presented in square metres. As such, the raw artefact values presented in Attachment F.4 are multiplied by four to present 'extrapolated' values.

As discussed above, artefacts recovered from T7P1 reflect 82% of the total excavated assemblage; and this was overwhelmingly dominated by quartz. At this location it is likely a thick vein of macrocrystalline milky quartz was exposed. Pockets of crystal quartz were present in cavities within the milky quartz vein, and these were also extracted and worked. Due to the abundance of milky quartz, it appears that only initial reduction was applied in relation to the cores, with few flakes removed. The extremely high densities in this location (potentially $>8,000/m^2$) may suggest this formed an important resource of probably the crystal quartz component for the general locale; and hence, T7P1 represents a location that was repeatedly visited to acquire stone. Of the 2,014 artefacts recovered from T7P1, 32% ($n=650$) represents non-artefactual debitage (i.e. angular fragments with no diagnostic features), likely by-products of material extraction and reflecting the generally poor quality of the quartz raw material source. This is also reflected by the high failure rate of artefact manufacture, measured by a high ratio of broken flakes compared to complete flakes (1:0.3). No formal tool types were recovered from this test pit. Based on the characteristics of the artefacts and non-artefactual material recovered at this location, T7P1 is considered to be on or very close to a stone material source, namely a highly brittle, poor-quality milky quartz vein, but with some evidence of a crystal quartz component of better quality (and possibly the target for Aboriginal people in the past). The abundance of raw material also allows expediency in flaking i.e., little curation was applied to maximise the use of the available material.

Of the remaining test pits (excluding T7P1), 448 artefacts were recovered from 115 test pits, representing an extrapolated average artefact density of 15.6 lithics/ m^2 . Of these test pits, the highest number of artefacts was recovered from T7P3 ($n=59$, 13%), followed by T13P5 ($n=51$, 11%) and T13P6 ($n=47$, 10%). More generally, 20 test pits (17%) recovered ≥ 6 artefacts (providing an extrapolated artefact density of $\geq 24/m^2$) and artefacts excavated from these test pits represent 90% of all excavated artefacts. A further seven test pits (6%) recovered between 3–5 artefacts (extrapolated artefact density of 11–23/ m^2), and eight test pits (7%) recovered 1–2 artefacts (extrapolated artefact density of $<10/m^2$). A total of 78 test pits (67%) contained no artefacts. Given this, an extrapolated value of ≤ 16 artefacts/ m^2 may be more accurate when considering the background scatter levels of the construction envelope. When combining test pits in close proximity, these findings ultimately identify fifteen discrete locales within the construction envelope where dense cultural material (extrapolated artefact densities of $\geq 24/m^2$) was present, and these are discussed further in Chapter 8.

The assemblage is dominated by milky quartz ($n=2,090$, 85%) with smaller counts of crystal quartz ($n=331$, 13%), cryptocrystalline quartz ($n=18$, 0.7%), volcanic ($n=14$, 0.6%), chalcedony ($n=5$, 0.7%), and trace amounts of quartzite ($n=4$, 0.2%), indurated mudstone ($n=2$, 0.1%) and silicified wood ($n=1$, $<0.1\%$). As discussed above, T7P1 is likely located on or very close to a milky quartz vein, which explains the dominance of milky quartz in the overall assemblage. Limited use of other sources (i.e. water-rolled) was identified in the excavated assemblage. Interestingly, the excavated assemblage is in contrast to the surface assemblage, which was dominated by hornfels cobbles, likely sourced from river cobbles in the Macleay River. Notably, quartz artefacts are notoriously difficult to positively identify in surface assemblages, due to unpredictable fracture mechanics, which complicate the distinction between naturally and culturally fractured quartz (Spry et al. 2020).

Across the construction envelope, the highest concentration of artefacts occurred at 10–20 cm ($n=43$, 2%) and 30–40 cm ($n=1,793$, 73%) below ground surface. These higher numbers of artefacts occurring in two layers may reflect different periods of occupation in the past. However, when applying size sorting and other taphonomic factors affecting the assemblage, it appears more probable that the locale was used across a single temporal period, and a portion of the assemblage has bioturbated down the soil profile. It is probable that the activity is primarily associated with the upper deposition at ~ 10 –20 cm, with materials beneath this having moved down through various soil processes.

Compositionally, the assemblage is comprised of 1,253 (51%) broken flakes, 759 (31%) angular fragments, 366 (15%) complete flakes, 27 (1%) cores, 9 (0.5%) tools (complete and broken) and various other core fragments, complete splits, etc. Two (0.1%) grinding fragments were also recovered from T11P2 and T22P1. The overall low frequency of other processing tool types (e.g. usewear, notched and scraper tools) suggests that the construction envelope was not occupied for a long duration but rather used to primarily extract raw materials, undertake the initial phases of artefact production, and the move to other locales for later reduction. Some spatial variation, different raw material types and a concentration of tools in Transect 5 may represent longer-term and/or repeat occupation in this locale.

Chronologically, the composition of the assemblage is all suggestive of a late Holocene (<5 ka) age. Artefact types recovered in the assemblage, such as atypical burin-blade cores and blades, are primarily found during this timeframe, with their increasing proliferation in the most recent period. Generally, a higher frequency of quartz is generally associated with a late-Holocene occupation. However, in this Project area, it may also reflect the limited availability of other raw material types immediately available.

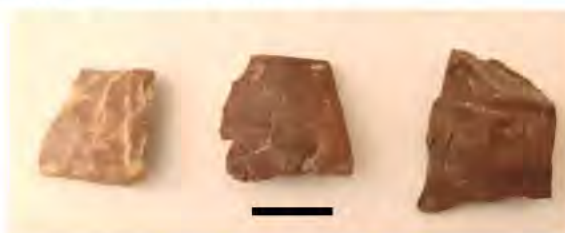


Plate 7.25 Examples of jasper artefacts recovered from T23P1 (id=435), T5P1 (id=84) and T4P13 (id=445) (left to right; scale = 1 cm)



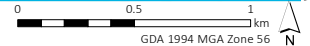
Plate 7.26 Example of tools recovered from the OMPS excavation, specifically in Transect 5 which had a high ratio of tools recovered in this area (left to right, id=114, id=188, id=197, id=170; scale = 1 cm)



Plate 7.27 Large scraper and notch tools recovered from the OMPS excavation (left to right, id=456, id=471, id=82; scale=1cm)



Source: EMM (2022); DFSI (2017); GA (2011); SMEC (2022)



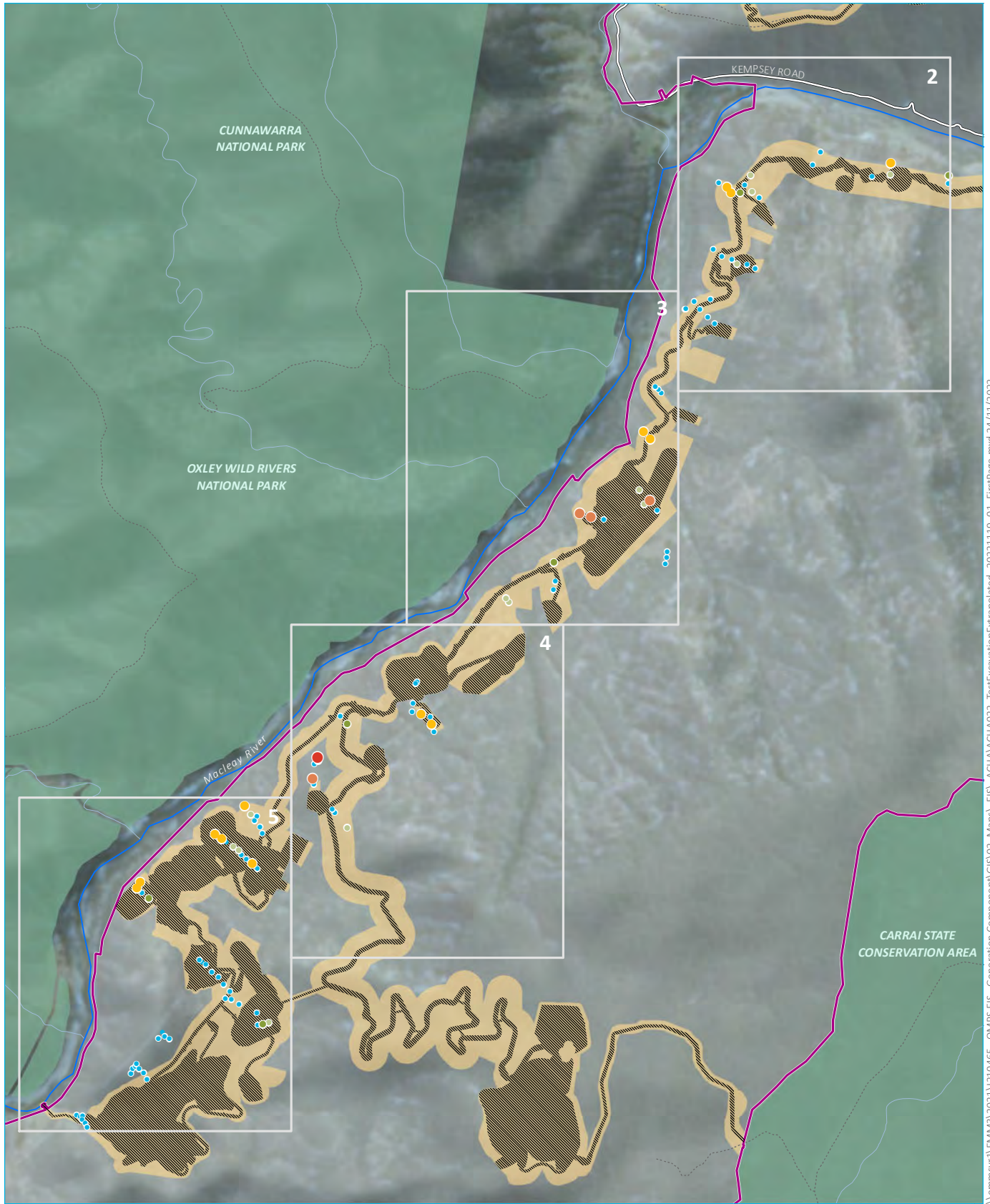
KEY	
Project area	Existing environment
Disturbance footprint	Road
Construction envelope	Track
Number of artefacts (n)	
None	Macleay River
1 - 2	Watercourse/drainage line
3 - 5	NPWS reserve
6 - 100	State forest
100+	

Test excavation results

Oven Mountain Pumped Hydro Energy Storage Project
 Aboriginal cultural heritage assessment
 OMPS Pty Ltd
 Figure 7.5



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\LEIS\ACHA\ACHA018_TestPIResults_20221110_02.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- | | |
|-----------------------------|--------------------------------|
| Project area | Number of artefacts (n) |
| Disturbance footprint | None |
| Construction envelope | 1 - 15 |
| Existing environment | 16 - 24 |
| Macleay River | 25 - 100 |
| Watercourse/drainage line | 101 - 250 |
| Major road | 8056 |
| Vehicular track | |
| NPWS reserve | |

Test excavation results (extrapolated)
Map 1 of 5

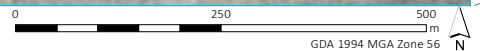
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.6



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\EIS_ACHA\ACHA022_TestExcavation\Extrapolated_20221119_01_FirstPage.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

- | | |
|---------------------------|--------------------------------|
| Project area | Number of artefacts (n) |
| Disturbance footprint | None |
| Construction envelope | 1 - 15 |
| Existing environment | 16 - 24 |
| Macleay River | 25 - 100 |
| Watercourse/drainage line | |
| Major road | |

Test excavation results (extrapolated)
Map 2 of 5

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.6



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\EIS\ACHA\ACHA022_TestExcavation\Extrapolated_20221119_01.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- | | |
|---------------------------|--------------------------------|
| Project area | Number of artefacts (n) |
| Disturbance footprint | None |
| Construction envelope | 1 - 15 |
| Existing environment | 16 - 24 |
| Macleay River | 25 - 100 |
| Watercourse/drainage line | 101 - 250 |
| Vehicular track | |
| NPWS reserve | |

Test excavation results (extrapolated)
Map 3 of 5

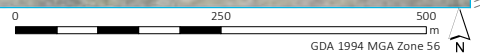
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.6



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\LEIS\ACHA\ACHA022_TestExcavation\Extrapolated_20221119_01.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

- | | |
|---------------------------|--------------------------------|
| Project area | Number of artefacts (n) |
| Disturbance footprint | None |
| Construction envelope | 1 - 15 |
| Existing environment | 16 - 24 |
| Macleay River | 25 - 100 |
| Watercourse/drainage line | 101 - 250 |
| NPWS reserve | 8056 |

Test excavation results (extrapolated)
Map 4 of 5

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.6



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\Maps\EIS\ACHA\A022_TestExcavation\Extrapolated_20221119_01.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- | | |
|---------------------------|--------------------------------|
| Project area | Number of artefacts (n) |
| Disturbance footprint | None |
| Construction envelope | 1 - 15 |
| Existing environment | 16 - 24 |
| Macleay River | 25 - 100 |
| Watercourse/drainage line | |
| NPWS reserve | |

Test excavation results (extrapolated)
Map 5 of 5

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 7.6



\\emmsvr1\EMMS\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\EIS\ACHA\ACHA022_TestExcavation\Extrapolated_20221119_01.mxd 24/11/2022

8 The archaeological and cultural resource

8.1 Key findings

- The assessment undertook cultural mapping, archaeological field survey and test excavations to explore and document the Aboriginal objects, site and places within the Project area, and to align them within the regional context. Overall, the regional context has limited archaeological information, rather being dominated by a complex cultural landscape of mythological, historical and post-Contact places and activities, including frontier violence, pastoral station activities, reserves and missions. Archaeologically, less appears documented in the immediate region, and as such the ACHA provides a baseline with which to compare future studies. Overall, the findings were found to largely conform with the regional models, with a number of traditional, historical and contemporary ethnographic sites documented across the region. Numerous archaeological findings were also made, typically closely associated with the Macleay River, and especially its confluence with Georges Creek.
- These various site validation activities undertaken over a five-month period resulted in duplication and overlap of results presented in Sections 5.4.2, 7.2.3 and 7.3.2. When combining and ratifying these findings, there are some 44 identified sites and places along with a continuous and complex distribution of surface and shallowly buried stone artefacts distributed across the construction envelope. These can be broken down as:
 - Four cultural, historical and/or social history sites, including: Kunderang Station (OMPS-CS3), a large pastoral station to the west of the Project area with a history of frontier conflict and associated with the pastoral history interlinked with work lives of local Aboriginal families; George's Creek Camp (OMPS-CS4) and Lower Creek/Long Flat Station (OMPS-CS5), both post contact camp sites and the reported locations of initiation ceremonies; and, AHIMS# 21-5-0023, a catfish increase site believed to be situated on a large rock in a portion of rapids within the Macleay River.
 - Forty archaeological sites including: 24 culturally modified trees (OMPS-ST1 – 24), six stone arrangements (OMPS-SA1 – 6), five artefact scatters with ≥ 24 artefacts identified (AHIMS #21-5-0142, OMPS-AS1, 26, 33 and 36) two quarry sites (OMPS-Q1 and 2), two rockshelters (OMPS-R1 and 2), and one grinding groove site (OMPS-GG1). Many of these sites were assigned a tentative classification given a lack of archaeological characteristics; and all are recommended for further specialist investigation.
 - A stone artefact background scatter across the entire construction envelope and extending beyond its limits within which artefact densities of $\sim 16/m^2$ may be expected (OMPS-BS1), and which includes identified isolated Aboriginal objects (OMPS-IF1 – 32 inclusive) and low-density artefact scatters (OMPS-AS2–25, 27–32, 34–35, and 37–42 inclusive). These sites are typically of low significance and reflect the long-term, transient use of the entire landscape by Aboriginal people in the past.
 - Fifteen areas of past foci and activity (OMPS-FA1 – 15 inclusive) characterised by high densities of primarily sub-surface artefacts ranging from $\sim 24 \rightarrow 236/m^2$ ($\bar{x} = 81/m^2$) with at least one test pit (T7P1, now OMPS-FA7) having values of $>8,000/m^2$ and which reflect extensive and/or repeated visitation and occupation by people over the last 5ka. Several of the field observations are also encompassed within these site's curtilage, where stone artefacts were identified on the surface near these locations during the test excavation program. These foci are generally small and averaging ~ 0.6 ha (80 x 80 m) in size, although several of them overlap to form larger areas.

8.2 Results and synthesis

Past studies and previously documented Aboriginal heritage within the region have been limited. This is in part due to the rugged and inaccessible terrain, and due to the lack of development that results in cultural heritage management investigations. To date, past studies have focussed on the anthropological aspects of Aboriginal heritage and the post-Contact period. The region has a deep history in these fields, with some 17% of previously identified sites reflecting mythological and/or ceremonial sites important to the Thunggutti people. This is in stark contrast to other studies in the broader region along the eastern coast and New England Tablelands, which are dominated by archaeological signatures. The data from this broader region also includes numerous sites associated with this complex cultural landscape, including burials, stone arrangements and bora rings. Indeed, the Carrai waterholes, a significant gender restricted (male) site not within the Project is perhaps one of the best known cultural places within the local Aboriginal community; and even during the ACHA process remained an area that archaeologists, EMM personnel, and many of the Aboriginal participants were forbidden to visit.

A review of the desktop information similarly is dominated by information on early Aboriginal-European interactions, including frontier violence, pastoral activities, and the later mission period. Many of these events and locations are well-documented and contain abundant information, with the works of Blomfield (1981) providing perhaps the most vivid account of this period. As has been explored in Chapter 5, few, if any, of these activities appear to extend into the Project area, but it was nonetheless surrounded by well-documented events throughout the 19th and early 20th Century.

Archaeologically, there has been less investigation in this region. Some 39% of the previously documented sites are artefactual in nature. However, these appear to have been recorded opportunistically or as part of limited development activities and/or research activities. An example of this is the stone axe production site, #21-5-0142, located within the Project area, and recorded by one of the Aboriginal participants while camping at Georges Junction. Where documented, these sites appear to reflect a fairly ephemeral activity of the region, with most reflecting an isolated or small density of artefacts, perhaps indicative of a single use campsite. There is limited academic or broader research on the deep time history of this locale, with documented dates of archaeological sites all significant distances away (e.g. along the coastal fringe or in the vicinity of Armidale). Limited dating of a rockshelter and associated alluvial floodplains along Kunderang Brook, 25 km south of the Project area, suggests the scouring of the floodplains of the Macleay at 3,000 BP, removing many sites that may have been present prior to this date. In this limited study, Aboriginal occupation of the area recommences around 1,500 BP in subsurface deposits, with age/depth models suggesting surface sites are likely no older than 500 years at most. Therefore, it can be expected that while there is potential for early activities in the general region (e.g. Crazy Man rockshelter at Coonabarabran dating to ~18 ka), more commonly the archaeological sites documented, and their cultural materials, appear more aligned with Holocene characteristics (<5,000 years ago), and have been shown to extend into the contact period.

It is within this context that the current ACHA has been developed. Desktop information for this report identified four previously documented sites AHIMS #21-5-0011, #21-5-0023, #21-5-0142 and #21-5-0143 within the Project area. Of these, three (AHIMS #21-5-0023, #21-5-0142 and #21-5-0143) are considered to be in close proximity to – but not within – the construction envelope. Only one of these sites (AHIMS #21-5-0142), a large artefact scatter located at the crest of a long, gently sloped spur – an important stone axe production site – was able to be positively identified during the fieldwork program.

An extensive program of ground-truthing was undertaken as part of this assessment, including cultural mapping, archaeological field survey and test excavations of the Project area. The aim of these works was to both validate the regional models specific to the construction envelope and identify any previously undocumented cultural sites, places and/or material.

The cultural mapping undertaken with key knowledge-holders identified 12 sites and places that held cultural importance to the Aboriginal community (Table 5.1; Figure 8.1). These included a number of locations in the general region, which carry traditional and/or contemporary value to individuals and the local Thunggutti community. These sites were assessed by the anthropologist to reflect either cultural sites, historical sites and/or social history places, each aligning with whether they represented traditional or more contemporary values to the Aboriginal participants. Overall, of the 12 sites, five were considered as both historical and social history places (OMPS-CS2–3 and 8–10), three as both cultural and social history places (OMPS-CS4–5 and 11), two as cultural places (OMPS-CS1 and 12), and one as a historical place (OMPS-CS7). Of these, three are considered to be in close proximity to the Project area and may potentially interact with the Project:

1. Kunderang Station (OMPS-CS3), a large pastoral station to the west of the Project area with a history of frontier conflict and associated with the pastoral history interlinked with work lives of local Aboriginal families.
2. George's Creek Camp (OMPS-CS4), a post-Contact camp sites and the documented locations of initiation ceremonies.
3. Lower Creek/Long Flat Station (OMPS-CS5), a post-Contact camp sites and the documented locations of initiation ceremonies.

At this stage, interactions with the Project would be primarily associated with view-lines to and from part of the proposed development activities, with none of the sites in the construction envelope. Discussions to date on these sites have not identified that view-lines play a role in their cultural value, but this would require exploration (and the development of management measures where needed) in subsequent stages of the Project. In addition, discussions included cultural flows and the need for the Macleay River to be unaffected to maintain the spiritual and physical health of the Thunggutti people. Indeed, one of the previously documented sites, a natural increase site (AHIMS #21-5-0023) – a site where ritual activity was undertaken to increase a species within the river – is within the Macleay River just outside the Project area, south of Georges Junction. Further, documentary evidence of the region suggests that the Macleay River corridor was used by Aboriginal people throughout the post-Contact period to move between Kunderang Station and Georges Junction. The study also provided a wealth of information on flora, fauna, totems and other aspects of Thunggutti culture, which will be extremely valuable to the local Aboriginal community in general; and in any post-approval activities associated with the Project (e.g. informing heritage interpretation, re-vegetation and site re-establishment, etc).

The Carrai waterholes, an Aboriginal Place, has been extensively mentioned throughout the ACHA process as a highly significant cultural place. This is discussed in Appendix D. This site is ~3 km south of the Project area and will be unaffected by the proposed development activities. The site cannot be seen from the Project area, and hydrological studies have concluded that no adverse impacts would result from the Project (EMM, 2022b, 2022c).

The field survey identified some 109 Aboriginal sites, places and/or objects across the construction envelope (Appendix F.2, Figure 8.1). One of these sites (AHIMS #21-5-0142) had previously been documented by one of the Aboriginal participants in the Project. These sites were dominated by low density surface stone artefacts (artefact scatters = 42 [39%]; isolated Aboriginal objects = 23 [21%]), and potential culturally modified trees (n=23, 21%). Two artefact sites were identified as of particular significance to the Aboriginal participants, including an axe production site (AHIMS #21-5-0142) overlooking the confluence of the Macleay River and Georges Creek, and another artefact scatter (OMPS-AS26) with deep subsurface potential located on the banks of the Macleay River towards the easternmost point of the proposed EAR. Neither site is within the proposed disturbance footprint and therefore should not be impacted by the Project. Several other site types were also identified, including stone arrangements (n=6, 6%), quarry sites (n=2, 2%), rockshelters (n=2, 2%) and grinding grooves (n=1, 1%).

Few of these identified sites are characteristic of findings within the broader archaeological record, and all will be proposed for further validation in subsequent stages of the Project. Spatially, the survey findings show sites across the construction envelope, but primarily in close proximity to the Macleay River corridor, and notably around its confluence with Georges Creek (Figure 8.1).

The archaeological test excavations were undertaken to explore the subsurface potential for cultural material. These investigations focussed on the construction envelope on the spurcrests, spurslopes and hill slopes of the eastern bank of the Macleay River. As discussed in Section 7.3.2, some 76% of the program has been completed, with elements of the EAR yet to be excavated, but in which many of the same types of landforms are found.

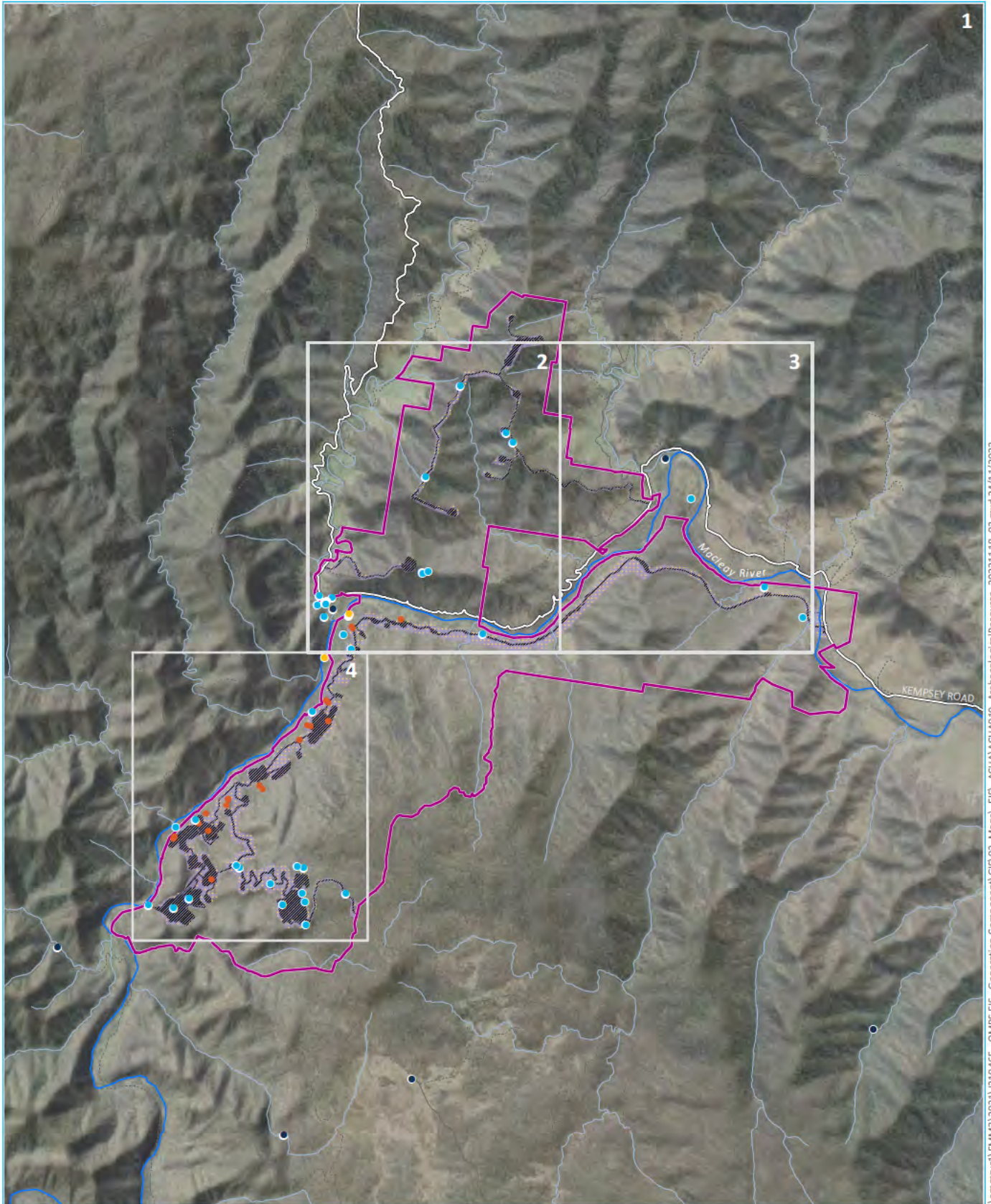
The excavations revealed that cultural materials were found in low densities, $\sim 16/m^2$ when extrapolated, across the construction envelope, and reflecting ephemeral use of the river corridor as a thoroughfare for Aboriginal people. As outlined above, there is documentary evidence of the river corridor being used throughout the post-Contact period, and this likely extended into the past. Within this broader background scatter were disparate locales where more intense activity and occupation occurred. These locations were almost exclusively found on spurcrests in close proximity to Macleay River and retained artefact densities of $>24/m^2$. These sites were typically within 350 m of the river, but this distance is dictated by both the highly variable Macleay River that can expand in width by a hundred metres during flood, and by the location of spurcrest landforms, all of which are some distance from the water's edge. Indeed, the stone axe production site (AHIMS #21-5-0142) – one of the most significant findings of the investigations – is on one of the rare locations where the spurcrest overlooks the river.

An analysis of the assemblage suggests that artefact production was early in the reduction sequence, and indicative of the extraction of raw materials from both outcrops and pebbles from the river itself. These materials were initially reduced, presumably to a manageable size, and then relocated through movement, down-the-line exchange or trade elsewhere in the region. This is most evident of T7P1 within which some 2,049 artefacts (or $>8,000$ when extrapolated) dominated by quartz raw material, and a significant portion of non-diagnostic angular fragments that result from such early reduction. These cultural materials are predominantly found in the upper 40 cm of the soil profile and appear to represent use of the region within the last 5,000 years. Based on the field survey results, these past foci appear to be ~ 0.6 ha (80 x 80 m) in size, and in some areas overlap with each other to form larger foci of activity. Specifically, some 15 discrete areas of past foci are evident within the Project area.

When combining and ratifying the information above, the construction envelope and immediate proximity can be considered to encompass the following Aboriginal sites, places and/or objects (Figure 8.1):

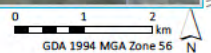
- Four cultural, historical and/or social history sites, including: Kunderang Station (OMPS-CS3), a large pastoral station to the west of the Project area with a history of frontier conflict and associated with the pastoral history interlinked with work lives of local Aboriginal families; George's Creek Camp (OMPS-CS4) and Lower Creek/Long Flat Station (OMPS-CS5), both post contact camp sites and the reported locations of initiation ceremonies; and, AHIMS# 21-5-0023, a catfish increase site believed to be situated on a large rock in a portion of rapids within the Macleay River.
- Forty archaeological sites including: 24 culturally modified trees (OMPS-ST1 – 24), six stone arrangements (OMPS-SA1 – 6), five artefact scatters with ≥ 24 artefacts identified (AHIMS #21-5-0142, OMPS-AS1, 26, 33 and 36) two quarry sites (OMPS-Q1 and 2), two rockshelters (OMPS-R1 and 2), and one grinding groove site (OMPS-GG1). Many of these sites were assigned a tentative classification given a lack of archaeological characteristics; and all are recommended for further specialist investigation.
- A stone artefact background scatter across the entire construction envelope and extending beyond its limits within which artefact densities of $\sim 16/m^2$ may be expected (OMPS-BS1), and which includes identified isolated Aboriginal objects (OMPS-IF1 – 32 inclusive) and low-density artefact scatters (OMPS-AS2–25, 27–32, 34–35, and 37–42 inclusive). These sites are typically of low significance and reflect the long-term, transient use of the entire landscape by Aboriginal people in the past.

- Fifteen areas of past foci and activity (OMPS-FA1 – 15 inclusive) characterised by high densities of primarily sub-surface artefacts ranging from ~ 24 - $\rightarrow 236/m^2$ ($\bar{x} = 81/m^2$) with at least one test pit (T7P1, now OMPS-FA7) having values of $>8,000/m^2$ and which reflect extensive and/or repeated visitation and occupation by people over the last 5ka. Several of the field observations are also encompassed within these site's curtilage, where stone artefacts were identified on the surface near these locations during the test excavation program. These foci are generally small and averaging ~ 0.6 ha (80 x 80 m) in size, although several of them overlap to form larger areas.



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



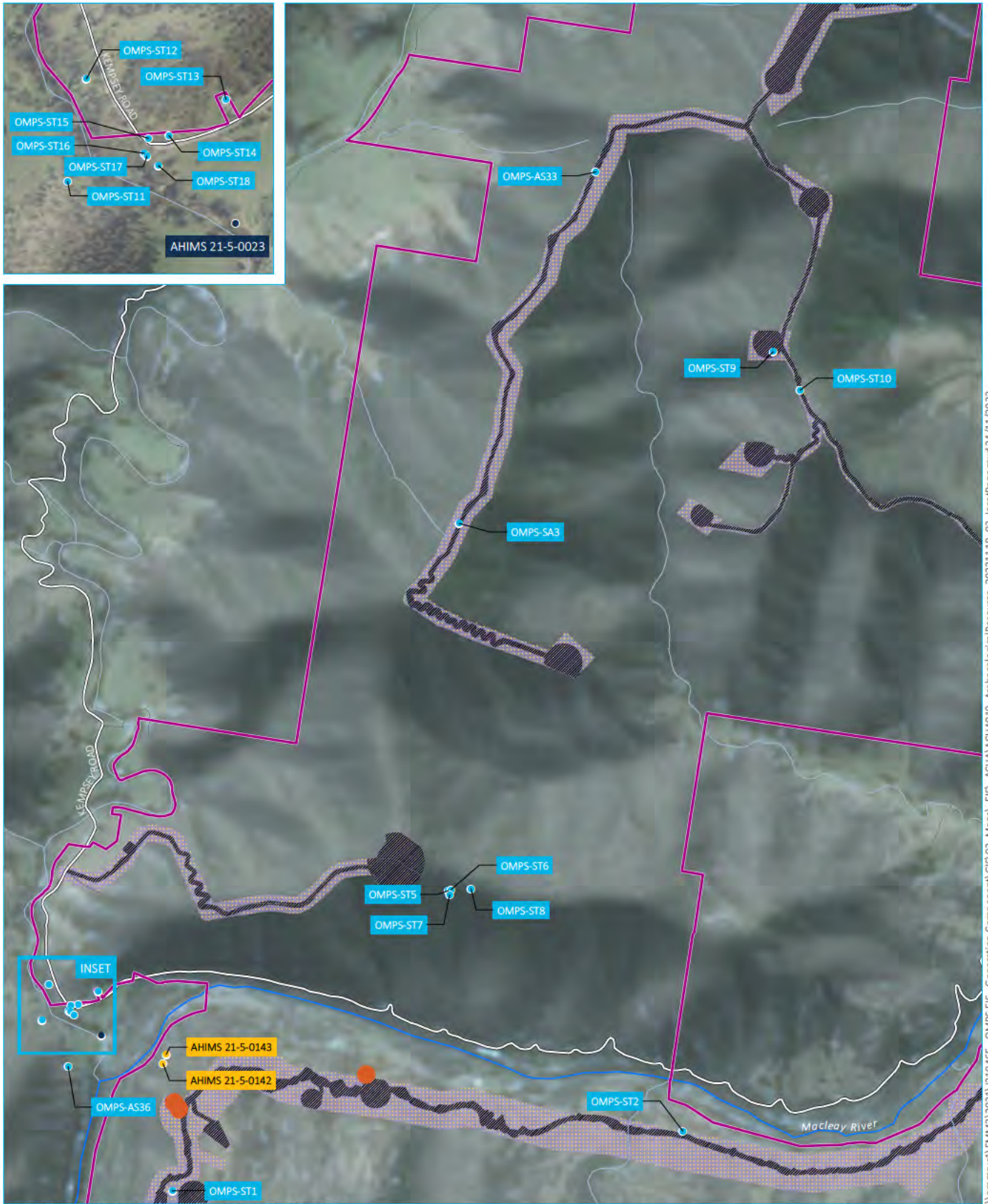
KEY

- | | |
|-----------------------------------|---------------------------|
| Project area | Existing environment |
| Disturbance footprint | Macleay River |
| Construction envelope | Watercourse/drainage line |
| Surveyed Aboriginal site | Major road |
| Cultural site | Minor road |
| Previously registered AHIMS sites | Vehicular track |
| Key heritage area | |
| Background scatter (OMPS-BS1) | |

The archaeological and cultural resource
Map 1 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 8.1





Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- Project area
- Disturbance footprint
- Construction envelope
- Surveyed Aboriginal site
- Cultural site
- Previously registered AHIMS sites
- Key heritage area
- Background scatter (OMPS-BS1)
- Existing environment
- Macleay River
- Watercourse/drainage line
- Major road
- Vehicular track

The archaeological and cultural resource
Map 2 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 8.1



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

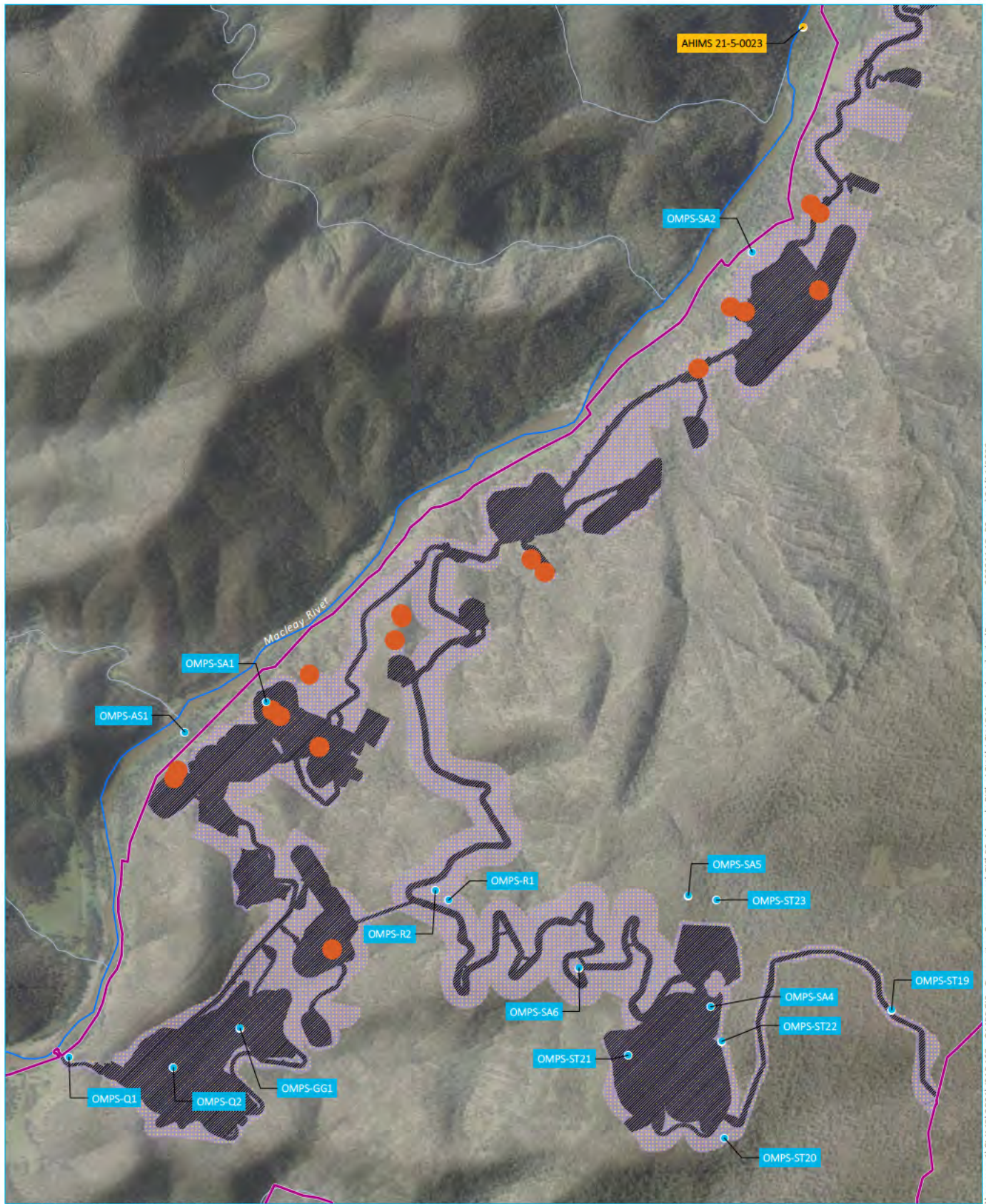
- | | |
|-------------------------------|---------------------------|
| Project area | Existing environment |
| Disturbance footprint | Macleay River |
| Construction envelope | Watercourse/drainage line |
| Surveyed Aboriginal site | Major road |
| Cultural site | Minor road |
| Background scatter (OMPS-BS1) | Vehicular track |

The archaeological and cultural resource
Map 3 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 8.1



\\emmsvr1\EMM3\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\Maps\EIS_ACHA\ACHA019_ArchaeologicalResource_20211118_03.mxd 24/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

- | | |
|-----------------------------------|---------------------------|
| Project area | Existing environment |
| Disturbance footprint | Macleay River |
| Construction envelope | Watercourse/drainage line |
| Surveyed Aboriginal site | Vehicular track |
| Previously registered AHIMS sites | |
| Key heritage area | |
| Background scatter (OMPS-BS1) | |

The archaeological and cultural resource
Map 4 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 8.1



\\emmsvr1\EMM3\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\EIS_ACHA\ACHA019_ArchaeologicalResource_20221118_03.mxd 24/1/2022

9 Significance assessment

9.1 General

All Aboriginal objects in NSW are protected under the *National Parks and Wildlife Act 1974* (NPW Act). It is recognised that the impact or destruction of sites may be necessary to allow other activities or developments to occur. In order for the consent authority to make informed decisions on such matters, an important element of cultural resource management is determining the significance of cultural heritage places and objects to understand what may be lost; and how best it can be avoided or mitigated. However, it is highlighted that something can be of little or no significance and still be protected under the NPW Act.

Cultural significance is outlined in Article 1.2 of the *Burra Charter* - the best practise document for managing cultural heritage – as ‘aesthetic, historic, scientific, social or spiritual value for past, present or future generations’ (Australia ICOMOS 2013). These values are reiterated in the NSW guidelines, which determines cultural significance of a place can be assessed by identifying the values that are present across the subject area and assessing what is important and why (OEH 2011). In assessing the scientific significance of sites, aspects such as rarity and representativeness and the integrity must be considered. Generally speaking, a site or object that is rare will have a heightened significance, although a site that is suitable of conservation as ‘representative’ of its type will also be significant. Conversely an extremely rare site may no longer be significant if its integrity has been sufficiently compromised.

The criteria adopted for this report are defined in Table 9.1. The management implications of these sites’ significance are discussed in subsequent sections.

Table 9.1 A summary of criteria used to assess the cultural significance (OEH 2011, 8–10)

Criterion	Definition
Social value – Does the place have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons?	Social (or cultural) value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them. Social or cultural value can only be identified through consultation with Aboriginal people.
Historic value – Is the place important to the cultural or natural history of the local area and/or region and/or state?	Historic value refers to the association of a place with a historically important person, event, phase or activity. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have ‘shared’ historic values with other (non-Aboriginal) communities.
Scientific (archaeological) value – Does the place have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state?	Scientific (archaeological) value refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information. Information about scientific values is gathered through archaeological investigation undertaken in this report.
Aesthetic value – Is the place important in demonstrating aesthetic characteristics in the local, regional, and/or State environment?	Aesthetic value refers to the sensory, scenic, architectural and creative aspects of the place. It is often linked with social value, and can consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use. This value is only relevant to archaeological sites on only rare occasions, such as rockshelters that contain art, or culturally modified trees in prominent positions, etc.

9.2 Statement of significance

The assessment identified 44 discrete Aboriginal sites and places within, or near the construction envelope (Table 9.2; Figure 8.1). In addition, the entire construction envelope was characterised by a low density background artefact scatter interspersed with occasional areas of denser material associated with past foci and/or repeat occupation (OMPS-FA1-15 inclusive) (Chapter 8; Table 9.2). These continuous buried deposits were documented throughout the field investigations as part of the field survey and test excavations and were variously documented as OMPS-IF1 – 32 inclusive and OMPS-AS2–25, 27–32, 34–35, and 37–42 inclusive. (These locales and sites have now all been integrated into the broader background scatter identification for management purposes – see Table 9.2). The results align well with the regional archaeological and ethnographic record demonstrating both a deep-time, post-Contact and contemporary focus on the Macleay River corridor and notably its confluence with Georges Creek. Activities include post-Contact camps, ritual and mythological sites, and a broader record of stone artefactual material and culturally modified trees across the Project area. The integration of strong Aboriginal engagement and participation has further identified a range of less common and/or intangible sites providing a more comprehensive picture of the significance of the Project area in the past.

For the purposes of significance assessment, all sites and places have been assigned a classification, even where they are only identified as of tentative identification to allow the ACHA to be completed. It must be highlighted, however, that validation of these sites – some of which are ranked as moderate or high (i.e. regional) importance – may require their significance to be re-classified in the future. A range of recommendations to further clarify the classification of these sites is proposed in Chapter 11 to resolve this uncertainty where required.

When considering the scientific significance, a number of the sites and zones can be considered to have moderate (local) or high (regional) significance with the ability to provide information on the past activities of the area (research potential). These sites can primarily be divided into three main categories, rockshelters, high-density artefact scatters, and post-Contact sites. In the case of rockshelters, further validation of the two identified sites is required, since neither exhibit the characteristic open caves with large floors and/or talus slopes that are common in the broader region. However, should they prove of cultural origin, they would provide an important archive of deep time activity in the region – a region that currently lacks investigation of such sites, or a robust chronology of past activities. Similarly, the areas of past foci and/or repeated occupation have demonstrated exploitation of the river corridor extending over the last 5,000 years. While limited excavations have occurred as part of the ACHA, it is considered that further investigation of these high-density zones (e.g. #21-5-0142, OMPS-AS26; OMPS-FA1-15 inclusive), and more detailed analysis of the assemblages recovered, has high potential to yield more information on the past economic and social behaviour of people in this region. This is especially the case for OMPS-FA7, which recovered some of the highest densities of cultural materials ever documented in the broader region, and which could significantly advance our understanding in the primary exploitation of a raw material resource. In the case of post-Contact camps, none are within the construction envelope, but all have the potential to provide information on the social, economic and domestic behaviours of Aboriginal people in the 19th and early 20th Century. In combination with Aboriginal oral history, they would provide a valuable window into this poorly documented period of the past, and one being increasingly explored by historians such as Stephen Gapps and Paul Irish elsewhere in recent years.

A number of the sites can also be considered to have some rarity and/or representativeness, which forms a part of the significance criterion. While the high-density artefact scatters identified are relatively common at a regional level, there are few documented in the Falls Country area, and certainly rarely with the number of artefacts recovered from some of the test pits (e.g. OMPS-FA7). As such, these can certainly be considered to have a local rarity. Given the general absence of formalised studies in the region, they can also be considered to provide a good representative sample of these types of sites until more research can be undertaken. Several of the cultural sites identified are similarly rare in both the local and regional context, most noticeably the identification of an increase ceremonial site within the Macleay River, which has few surviving analogues elsewhere; and the numerous cultural, historical and social history places identified as part of the ACHA.

The potentially culturally modified trees and stone arrangement sites, albeit tentatively identified at this stage, are also rare in the regional landscape (Chapter 5 and 6).

The remaining identified sites, including the broader background artefact scatter, are considered to have limited, if any research potential (Table 9.2). While important in demonstrating the longevity and continued use of the region by Aboriginal people in the past, it is considered that little further information can be obtained from additional investigation of these sites, places and objects.

A handful of the sites have some tangible historical significance (Table 9.2). Many of these relate to the cultural, historical and social history places that have been identified specifically for their relationship with our key Aboriginal knowledge-holders and their families; and as such have local historical values. The potential for Aboriginal people having lived and worked on many of the pastoral stations, and notably Kunderang and Long Flat, in the last 150 years also lends support to meeting thresholds for this criterion. These sites are of high significance, being able to provide information on the Contact period, and be of scientific, historical and cultural importance. With these exceptions, no specific historical significance can be assigned to the remaining objects, sites or places.

All the sites have some level of aesthetic value (significance), but only few can consider it an intrinsic part of their significance. These include, #21-5-0023, a natural increase site, that is situated entirely within the Macleay River. Its significance is linked to this position within the river as it is believed to influence the resources of the Macleay River (specifically Catfish populations). Many of the post-Contact camps and stations are also situated along these rivers for resources and would probably have not been established was this environment not present. Indeed, Georges Junction remains an important contemporary place for the local Aboriginal community to hunt and fish. Similarly, the high-density artefact scatter zones and areas adjacent the river were likely selected by people in the past, at least in part, due to their aesthetic appeal adjacent Macleay River and Georges Creek.

While all the sites form part of a cultural landscape encompassing the region, several of the sites have been identified throughout the ACHA process as particularly important to the local Aboriginal community. These include the sites and places identified through the cultural mapping investigation, including the Kunderang station and various post-Contact camps. Several of the archaeological sites were also vocalised as of importance to the Aboriginal participants during the on-site investigations, including the stone axe production site (#21-5-0142), OMPS-AS26 and OMPS-FA7. More broadly, the Macleay River and Georges Creek themselves have been identified as of cultural importance, and the need for hydrological regimes to be maintained into the future.

Table 9.2 provides a summary of the significance values for each Aboriginal object and/or site identified. Sites requiring further investigation and/or validation are considered to be of a tentative status and are indicated in red font within the table.

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-CS3		Historical/social history place	Kunderang Station associated with frontier violence and post-Contact pastoral activities	Valid	Moderate	-	Moderate	High	High
OMPS-CS4		Cultural/social history place	George's Creek Camp – a post-Contact camp and reported location of initiation ceremonies and other gatherings	Valid	High	Moderate	High	High	High
OMPS-CS5		Cultural/social history place	Lower Creek/Long Flat Station – a post-Contact camp and reported location of initiation ceremonies and other gatherings	Valid	Moderate	-	Moderate	High	High
Georges Creek	#21-5-0023	Cultural place	A natural increase site located within the Macleay River.	Valid	Moderate	Moderate	-	High	High
OMPS-ST1		Culturally modified tree	A potential culturally modified tree on a spurcrest >500 m east of the Macleay River.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST2		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on an alluvial terrace, ~230 m south of the Macleay River.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST3		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on an alluvial terrace, ~230 m west of the Macleay River.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST4		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on an alluvial terrace, ~345 m west of the Macleay River.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST5		Culturally modified tree	A potential culturally modified Maiden's gum (<i>Eucalyptus maidenii</i>) identified on a ridgeline at the top of a very tall mountain range.	Tentative	Moderate	Low	-	Moderate	Moderate

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-ST6		Culturally modified tree	A potential culturally modified tree identified on a ridgeline at the top of a very tall mountain range.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST7		Culturally modified tree	A potential culturally modified Maiden's gum (<i>Eucalyptus maidenii</i>) identified on a ridgeline at the top of a very tall mountain range.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST8		Culturally modified tree	A potential culturally modified mature <i>Eucalyptus sp.</i> identified on a ridgeline at the top of a very tall mountain range.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST9		Culturally modified tree	A potential culturally modified Maiden's gum (<i>Eucalyptus maidenii</i>) identified on a very steep spurslope near the top of a very tall mountain range.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST10		Culturally modified tree	A potential culturally modified mature <i>Eucalyptus sp.</i> tree on an access track that runs along and adjacent to the ridgeline of the mountains.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST11		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the alluvial flats ~60 m southwest of Georges Creek.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST12		Culturally modified tree	A potential culturally modified brown stringy bark, (<i>Eucalyptus baxteri</i>) identified on the on the alluvial flats ~60 m north east of Georges Creek.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST13		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the	Tentative	Moderate	Low	-	Moderate	Moderate

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
			deeply incised alluvial bank of Georges Creek, ~60 m northeast of the creek itself.						
OMPS-ST14		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~100 m northeast of the creek itself.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST15		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~80 m northeast of the creek itself.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST16		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~65 m northeast of the creek itself.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST17		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~65 m northeast of the creek itself.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST18		Culturally modified tree	A potential culturally modified river red gum (<i>Eucalyptus camaldulensis</i>) identified on an alluvial terrace, ~50 m northeast of Georges Creek near Georges Junction where the creek meets the Macleay River.	Tentative	Moderate	Low	-	Moderate	Moderate

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-ST19		Culturally modified tree	A potential culturally modified young <i>Eucalyptus sp.</i> tree on the relatively flat to gently undulating plateau of the Carrai Plateau.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST20		Culturally modified tree	A potential culturally modified mature <i>Eucalyptus sp</i> tree identified on the relatively flat to gently undulating plateau of the Carrai Plateau.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST21		Culturally modified tree	A potential culturally modified tree identified on the relatively flat to gently undulating plateau of the Carrai Plateau.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST22		Culturally modified tree	A potential culturally modified tree identified on the steep slope where the Carrai Plateau starts to drop away into the Macleay River Valley.	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST23		Culturally modified tree	A potential culturally modified tree on the steep slope where the Carrai Plateau starts to drop into the Macleay River Valley	Tentative	Moderate	Low	-	Moderate	Moderate
OMPS-ST24		Culturally modified tree	A potential gender-restricted (woman) culturally modified fig tree located by creekline on steep slope with granodiorite outcropping.	Tentative	-	Moderate	-	Moderate	Moderate

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-SA1		Stone arrangement	A potential stone arrangement identified on an outcrop of granodiorite, with an artefact scatter in proximity. The site is located on a level to gently inclined spurcrest adjacent to an access track, The stone arrangement comprises up to seven lines of small (generally <10 cm) rocks placed in wavy lines on outcropping granodiorite.	Tentative	Moderate	Low	-	High	High
OMPS-SA2		Stone arrangement	A potential stone arrangement identified on an outcrop of granodiorite. The site is located on a level to gently inclined terrace abutting the Macleay River (~210 m west) and on the verge of the active flood zone. The stone arrangement comprises a number of small (generally <10 cm) rocks on the outcrop, though they form no discernible pattern or form.	Tentative	Moderate	Low	-	High	High
OMPS-SA3		Stone arrangement	A potential stone arrangement located on a small saddle along the ridgeline in the mountains to the north of the Project area. The stone arrangement is very obscured by dense vegetation and features a few large slate boulders with no discernible form or pattern.	Tentative	Moderate	Low	-	High	High
OMPS-SA4		Stone arrangement	A potential stone arrangement identified on an outcrop of granodiorite. The site is located on a hillslope where the Carrai Plateau starts to drop into the Macleay River Valley. The arrangement has not discernible shape or form, and features a few (<10) granodiorite rocks on exposed granodiorite bedrock.	Tentative	Moderate	Low	-	High	High

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-SA5		Stone arrangement	A potential stone arrangement identified on an outcrop of granodiorite. The site is located on a small saddle along the ridgeline in the mountains to the north of the Project area. The arrangement has not discernible shape or form, and features a few (<5) granodiorite rocks on exposed granodiorite bedrock.	Tentative	Moderate	Low	-	High	High
OMPS-SA6		Stone arrangement	A potential stone arrangement identified on a spurcrest, where the Carrai Plateau drops into the Macleay River Valley. The stone arrangement consists of a loosely arranged pile of rocks.	Tentative	Moderate	Low	-	High	High
George's Junction Site	#21-5-0142	Artefact scatter	A stone axe production site situated overlooking the confluence of Georges Creek and the Macleay River. Previously identified by an Aboriginal participant and consisting of ~70 artefacts. A culturally modified tree was also recorded in this locale (AHIMS #21-5-0143) however it could not be relocated at the time of survey.	Valid	Moderate	Low	-	High	High
OMPS-AS1		Artefact scatter	A low-density artefact scatter (~25 artefacts) located in a dry mouth of a creek bed that forms a first order tributary of the Macleay River.	Valid	Low	-	-	Moderate	Moderate
OMPS-AS26		Artefact scatter	An extensive stone artefact scatter (>100 artefacts) identified on relatively flat to gently sloped terrace abutting the Macleay River. This site has the potential for deeply buried cultural materials.	Valid	High	-	-	High	High

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-AS33		Artefact scatter	A low-density artefact scatter (~25 artefacts) identified on a portion of a disused access track that runs along the ridgeline of the mountains.	Valid	Low	-	-	Moderate	Moderate
OMPS-AS36		Artefact scatter	An extensive artefact scatter (>60 artefacts) located on an alluvial terrace at southwest corner of the junction where George's Creek meets the Macleay River.	Valid	Moderate	-	-	Moderate	Moderate
OMPS-Q1		Quarry	A potential hornfels quarry site identified on outcropping rock within a deeply incised creekline, near where it meets the Macleay River. A number of artefacts were recorded in the vicinity.	Valid	Moderate	-	-	Moderate	Moderate
OMPS-Q2		Quarry	A potential quarry site consisting of two large hornfels boulders within the creekline that show evidence of being struck. No artefacts were recorded in the vicinity.	Tentative	-	-	-	Moderate	Moderate
OMPS-R1		Rockshelter	Outcropping of large granodiorite boulders, providing a small overhang and a very small (100 cm (l) x 50 cm (w)) cave entrance, which extended back no more than a few metres.	Tentative	High	-	-	High	High
OMPS-R2		Rockshelter	Outcropping of large granodiorite boulders, providing a very small (65 cm (l) x 100 cm (w)) cave entrance, which extended back no more than a few metres. No overhang was present.	Tentative	High	-	-	High	High

Table 9.2 Significance of Aboriginal objects and/or sites identified near, or within the construction envelope

Site	AHIMS #	Site type	Brief description	Site status	Significance				
					Scientific	Aesthetic	Historical	Cultural	Overall
OMPS-GG1		Grinding groove	A potential grinding groove, located on a granodiorite rock boulder within the stream channel of a deeply incised third order tributary of the Macleay River.	Tentative	Low	-	-	Moderate	Moderate
OMPS-BS1 (including OMPS-IF1-32 inclusive, and OMPS-AS2 – 25, 27 – 32, 34 – 35, and 37 – 42 inclusive)		Artefact scatter	A stone artefact background scatter across the entire construction envelope within which artefact densities of <16/m ² may be expected and reflecting ephemeral and/or transient use of the region for at least 5 ka.	Valid	Low	-	-	Low	Low
OMPS-FA1-6 and 8-15 inclusive		Artefact scatter	Fourteen areas of past foci and activity characterised by high densities of primarily sub-surface artefacts ranging from 24- >230/m ² , and which reflect long term and/or repeat visitation and occupation by people over at least the last 5 ka.	Valid	Moderate	-	-	Moderate	Moderate
OMPS-FA 7		Artefact scatter	An area of past foci containing substantive artefacts (>8,000 /m ²) and reflecting primary extraction of a raw material resource by Aboriginal people over the last 5 ka.	Valid	High	-	-	High	High

- Notes:
1. Values are only assigned where the site fulfils that specific criterion.
 2. In the case of the cultural criterion, it is ranked in relation to whether the site is important to one individual (low), a mixed view from the Aboriginal participants (moderate) or broad-scale support from all stakeholders (high). Further details are presented in Section 5.3 and Attachment D.
 3. Cultural sites rankings are based on the cultural mapping report presented in Attachment D. While all sites identified were of value to the Aboriginal participants, some were clearly of more significance than others. Greater significance was also given to those that had broader regional analogues.
 4. Sites requiring further investigation and/or validation, are ranked based on the assumption the site proves valid. However, their significance should be revisited when further analysis and classification of them occurs. These values are presented in red to demonstrate their tentative status.
 5. The overall significance is comparable with the highest ranking achieved in any of the four main criteria.

10 Impact assessment

10.1 Key findings

- The Project would consist of the establishment of new infrastructure including off-river upper and lower water storage dams and reservoirs, transmission connection works and ancillary activities; tunnels, pumping stations, spillways, substation, access roads and tracks, quarries and temporary accommodation. The Project would result in a disturbance footprint of 330 ha. A larger construction envelope (around 780 ha) has been assessed as part of the EIS to allow some movement and flexibility in the Project's final design. However, any Project design changes within the construction envelope would be required to avoid Aboriginal sites and places considered of moderate or high significance.
- Of the 44 discrete Aboriginal sites and places sites within, or near the disturbance footprint, 12 would be potentially subject to some direct impacts resulting in their complete or partial loss; three would be inundated by the eventual reservoirs created; and four of the cultural places have the potential to be indirectly affected through view-line and/or hydrological changes, which require further exploration in subsequent stages of the Project. Some 25 of the sites would be unaffected, including several of moderate and high significance. In addition, the Project would directly impact some 5.74 ha (51%) of identified areas of high artefact densities, but OMPS-FA7 that contained the most significant cultural materials would be unaffected. A low-density stone artefact background scatter is considered present across the entire disturbance footprint and would also be adversely affected where disturbed.
- While the Project would result in some intergenerational/cumulative loss to cultural materials, it is considered that there would be numerous cultural heritage benefits. These include the long-term preservation of substantive cultural material that would be either inaccessible and/or managed from future harm, a greater understanding of the past and contemporary values in the region, and opportunities for heritage interpretation and both Aboriginal and public outreach.

10.2 Avoidance and re-design

The development and refinement of the Project has been iterative throughout the 2021-22 period and has been informed by the findings of the ACHA as they have become available. Changes have included:

- The design of the access track and EAR in such a way as to ensure avoidance of the predicted, and ultimately demonstrated, curtilage of the axe production site (AHIMS #21-5-0142).
- The discontinuation of the bridge crossing of the Macleay River following identification of significant cultural sites at Georges Junction.
- The removal of one of two initial options for the EAR joining the Armidale-Kempsey Road following the identification of the Lower Creek/Long Flat Station (OMPS-CS5) in this general location.
- Minor changes to the disturbance footprint, notably along the access track and EAR, to avoid many of the identified sites, such as OMPS-FA7.

10.3 Project impacts

As outlined in Chapter 2, the Project involves the establishment of new off-river upper and lower water storage dams and reservoirs, transmission connection works, and ancillary activities. In addition to these main components is tunnels, pumping stations, spillways, substation, access roads and tracks, quarries and temporary accommodation required to establish the Project. To determine how these impacts intersect with the environment, the ACHA considers both the construction envelope and the disturbance footprint. The Project would result in a disturbance footprint of around 330 ha, and a construction envelope of around 780 ha.

The disturbance footprint is a smaller area of potential impact based on currently available designs, while the construction envelope provides a slightly larger area to allow some flexibility in the Project designs as they continue to evolve. Importantly for the ACHA, the Project has committed to avoid where possible any Aboriginal sites or objects within the construction envelope that are identified as of moderate or high significance (Section 9.2) where such re-design occurs. Regardless, any change in the disturbance footprint would require suitable discussion and management as outlined in Chapter 11.

While specific design details remain in development, it is considered probable that the construction activities would require the removal of vegetation within the disturbance footprint and result in impacts >1 m of the upper soil profile. The foundations of the dams holding the reservoirs would be required to extend to bedrock, and thereby remove the upper soil profile, while the tunnels connecting them would similarly require extensive earthworks for their establishment. The ancillary activities would require less disturbance, but even the installation of roads and temporary accommodation would typically undertake the removal of topsoil and compaction prior to establishment, especially given the rugged terrain they pass through, and therefore impacts to the upper soil profile of at least 50 cm would be expected. All of these activities would require removal of trees and other surface debris (e.g. loose stones, etc) prior to establishment. Based on this, it is considered that any activities in the disturbance footprint would result in complete harm/impact to any identified Aboriginal objects or sites within it.

While the reservoirs are within the disturbance footprint, there is opportunity for some site types within them to be conserved through inundation. While vegetation would be removed, and potentially affect sites such as culturally modified trees, other features such as stone artefacts and buried cultural deposits may be relatively unaffected by inundation. Indeed, it would form a type of conservation since the sites would be protected from future harm. Numerous academic studies of existing dams and reservoirs internationally have demonstrated that the drowned soil profile elsewhere is relatively unaffected by inundation, with only discolouration and the loss of the organic surface (O horizon) being evident (e.g. Félix-Faure et al. 2019). Rather, the greatest impact from inundation is increased erosion along the reservoir's edge from wave action (e.g. Fagherazzi and Wiberg 2009; Vilhena et al. 2019). Specifically, Félix-Faure et al. (2019) states:

In the annual drawdown zone [comparable to a fluctuating FSL in this report], upper horizons of submerged soils are eroded, especially near the upper shore and on slopes. In the permanently drowned area, silty sediments cover drowned soils. Compared to reference soils, forest soils drowned for 84 years maintain their original morphological differentiation, but colors are dull, and the humus (O horizons) have virtually disappeared.

10.4 Aboriginal heritage impact

Two types of potential impact are considered, direct and indirect. Direct impacts relate to the construction activities and their removal, truncation and/or disturbance of the ground surface. This would include the removal of vegetation, removal or modification of geological outcropping and the removal or disturbance of the upper soil profile. Indirect impacts are the result of both construction and post-construction activities that may result in environmental changes that would affect cultural material within, or near the Project activities. General examples of indirect impact may include the burial of a soil profile resulting in its compression and indirectly damaging buried cultural material, or an increase in dust being blown into a rockshelter and negatively affecting art motifs should they be present. Of relevance to this ACHA is the potential impact to view-lines to and from places of cultural value, several being in close proximity to the Project area.

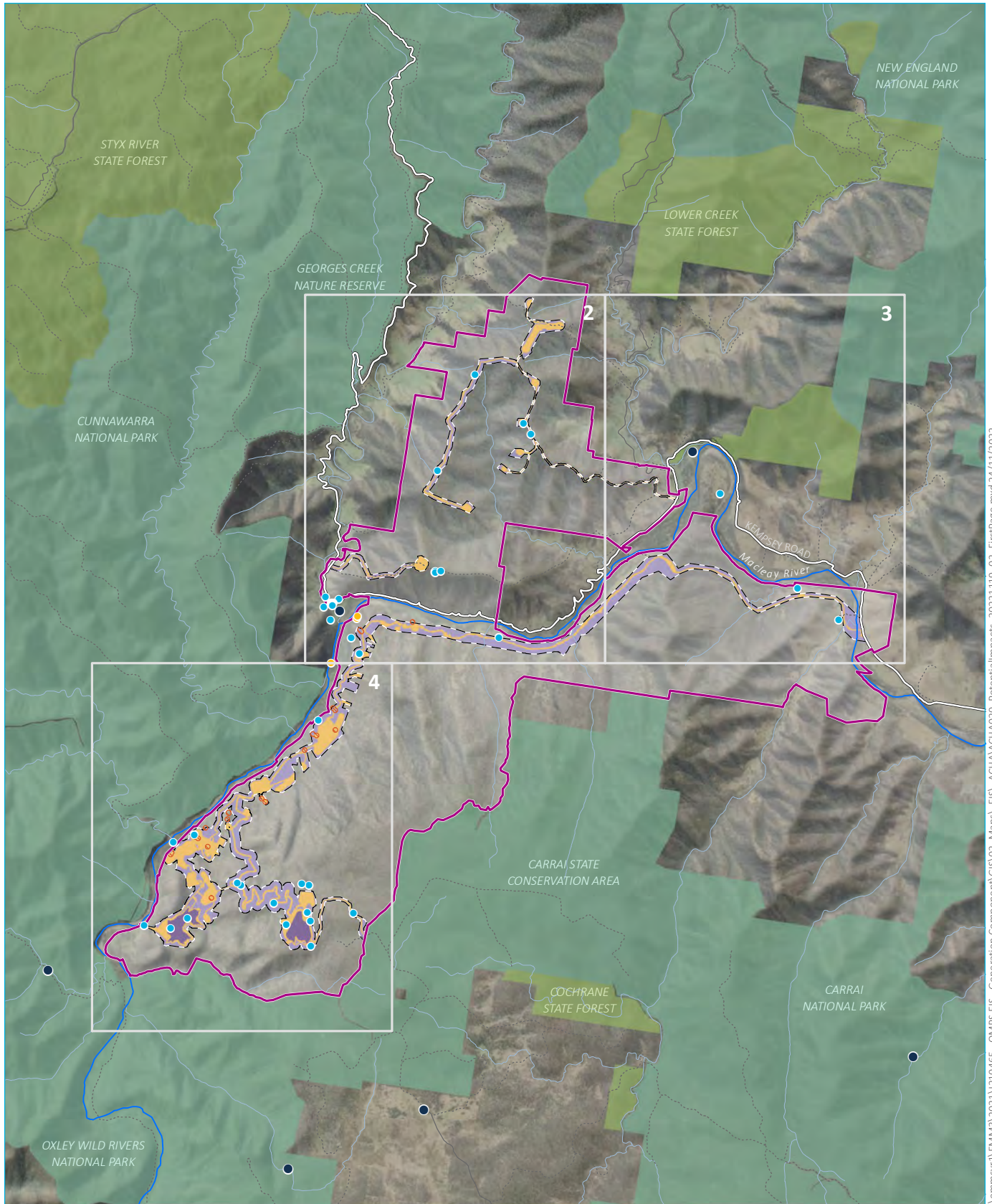
All cultural material identified within the construction envelope was either identified on the current land surface (e.g. rockshelters, stone arrangements, culturally modified trees) and/or buried within the upper ~0.5 m of the soil profile. As outlined in Section 10.2, several of the project activities would result in direct impacts to these sites and deposits were situated within the disturbance footprint (Table 10.1).

Specifically, of the 44 identified sites identified within or near to the Project area, 12 would be subject to direct impacts that would result in partial (OMPS-BS1) or complete loss of value (OMPS-ST2, OMPS-ST9, OMPS-ST10, OMPS-ST19, OMPS-ST21, OMPS-ST22, OMPS-SA1, OMPS-SA3, OMPS-SA6, OMPS-AS33, and OMPS-Q1) (Table 10.1; Figure 10.1). Several of these only have a tentative classification at this stage, and many are on the edge of the disturbance footprint where minor design changes may result in their conservation. Three sites (OMPS-SA4, OMPS-Q2, and OMPS-GG1) would be inundated and subject to indirect impacts, although based on details in Section 10.2 are not considered to result in their destruction, albeit being inaccessible in the future. Four of the cultural places (OMPS-CS3, OMPS-CS4, OMPS-CS5 and #24-5-0023) are also considered to have potential indirect impacts from changes to view-lines and/or hydrological regimes, and which are proposed for further exploration and management in Chapter 11. While the Landscape visual impact assessment for the EIS does not indicate any visual impacts to the Kunderang homestead (OMPS-CS3), the cultural mapping did not resolve whether it was the homestead itself or other parts of the station as being of value; and hence it has been proposed here as a potential indirect impact with recommendations for further exploration as the Project progresses. Importantly, 25 of the sites of high and moderate significance are currently outside of the disturbance footprint and would remain unaffected by the development activities. These include several of the highly significant sites, including the stone axe production site (#21-5-0142), OMPS-AS26, two rockshelters, and the majority of the culturally modified trees and stone arrangements documented (Table 10.1).

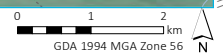
In relation to the significant buried cultural deposits, of the 11.28 ha encompassed within the 15 discrete foci zones, some 5.74 ha (~51%) would be directly affected primarily by the construction camp and surrounding activities (Figure 10.1). These encompass OMPS-FA1, OMPS-FA3, OMPS-FA4, and OMPS-FA12 in their entirety, and parts of OMPS-FA2, OMPS-FA8, OMPS-FA9, OMPS-FA10, and OMPS-FA11-15 inclusive. The remaining 49% of these deposits – and importantly the entirety of OMPS-FA7, which contains the highest densities of artefacts – would be unaffected by the Project.

As demonstrated in Chapter 8, the entire construction envelope is considered to encompass a low-density stone artefact background scatter of ~16 artefacts/m². Stone artefacts were either found as isolated objects and/or low-density artefact scatters as part of the field survey and/or as part of the test excavations. The latter allowing extrapolation of these values across much of the construction envelope. These findings reflect the long use of the Macleay River valley over several millennia but are considered to have limited archaeological significance. It would be expected that this background scatter would be encountered across much of the approx. 330 ha disturbance footprint and approx. 780 ha construction envelope.

In relation to indirect impacts, there are a number of cultural places that are not within the Project area or construction envelope, but that may be impacted through changes in the view-lines to and from them; or from hydrological regimes. While close to the lower reservoir, Kunderang homestead is situated in such a way that no direct view-lines to or from the construction envelope are evident, and as such it is considered that indirect impacts would be limited to this site, if any (see EMM, 2022e). However, George's Creek Camp and Lower Creek/Long Flat Station are both close to the access track and transmission line, respectively, and would have view-lines affected. While no reference to specific view-lines has been vocalised in relation to these sites – and their general spatial curtilages are vague – their values in part are associated with the aesthetic appeal and location on the Macleay River. As such, changes to the aesthetic qualities of the sites and their environs may result in indirect impacts to their values. In the case of #21-5-0023, the exact location of the site is unknown due to the high levels of Macleay River resulting in its probable submergence. While there is some potential that activities along the access track and/or the lower reservoir may result in view-line changes, of greater risk is the potential impact of changing flow regimes of the Macleay River from the project since the site is intrinsically linked to the river. Additional recommendations to manage any minor changes of flow that may affect this site's values are outlined in Chapter 11.



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

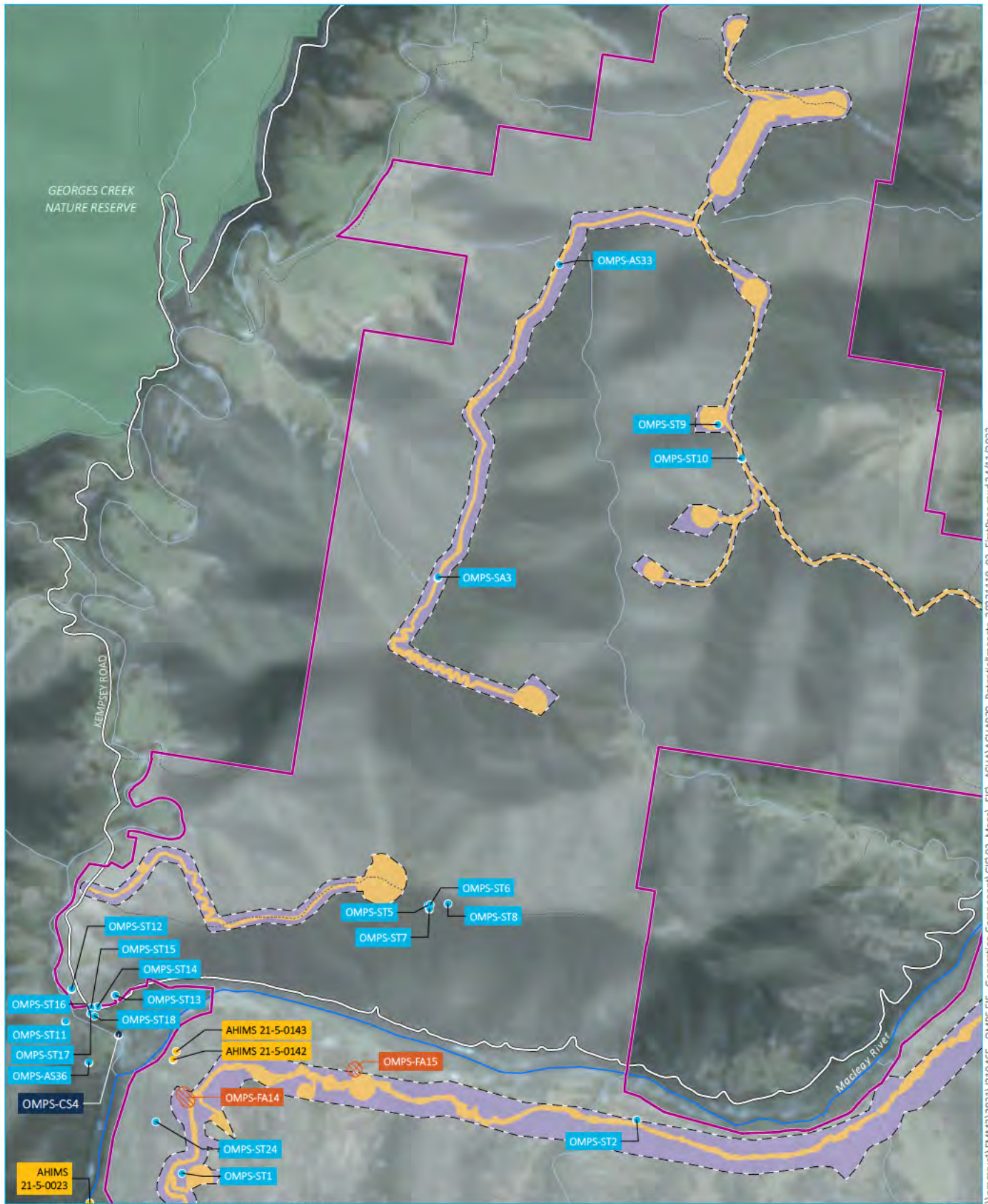
- | | |
|--|--|
| Project area | — Existing environment |
| ● Cultural site | — Macleay River |
| ● Surveyed Aboriginal site | — Watercourse/drainage line |
| ● Previously registered AHIMS sites | Major road |
| Construction envelope | Minor road |
| OMPS-BS1 | Vehicular track |
| Key heritage area | NPWS reserve |
| Direct impact area | State forest |
| Indirect impact area | |

Potential impacts
Map 1 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 10.1



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)

KEY

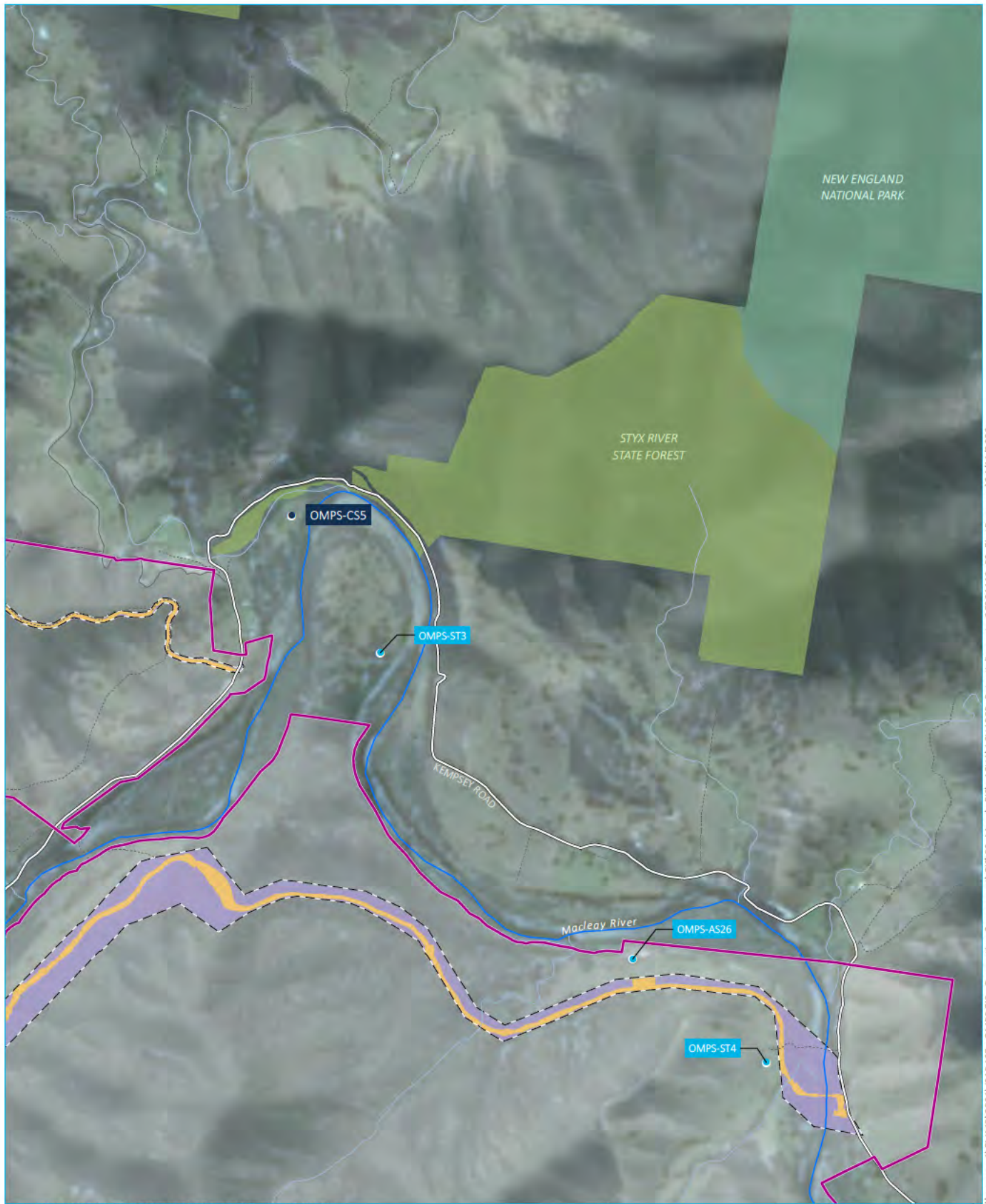
- | | |
|---|--|
| Project area | Existing environment |
| ● Cultural site | Macleay River |
| ● Surveyed Aboriginal site | Watercourse/drainage line |
| ● Previously registered AHIMS sites | Major road |
| Construction envelope | Vehicular track |
| OMPS-BS1 | NPWS reserve |
| Key heritage area | |
| Direct impact area | |

**Potential impacts
Map 2 of 4**

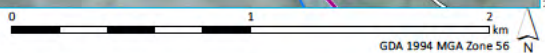
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 10.1



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Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



KEY

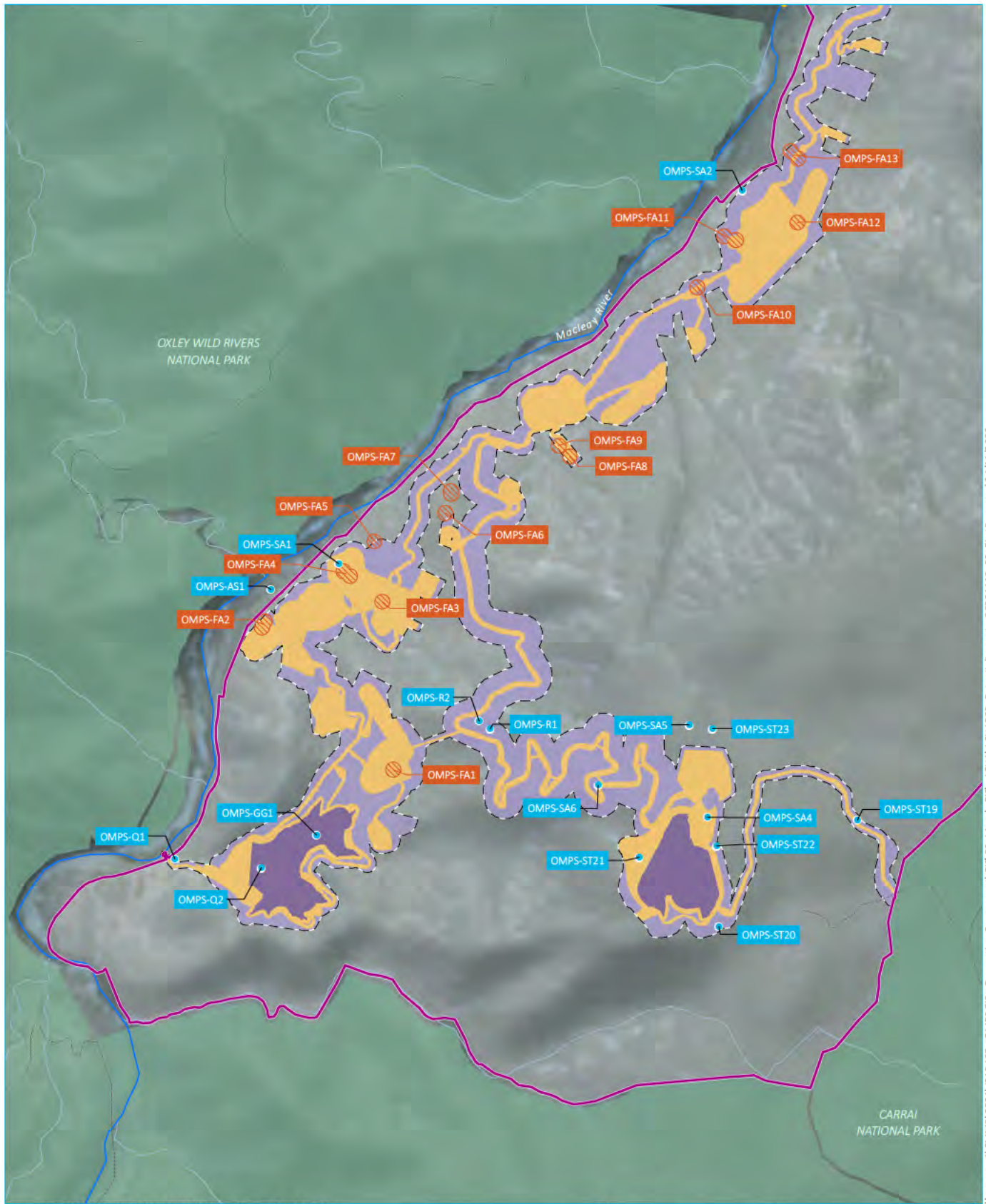
- | | |
|--------------------------|---------------------------|
| Project area | Existing environment |
| Cultural site | Macleay River |
| Surveyed Aboriginal site | Watercourse/drainage line |
| Construction envelope | Major road |
| OMPS-BS1 | Minor road |
| Direct impact area | Vehicular track |
| | NPWS reserve |
| | State forest |

Potential impacts
Map 3 of 4

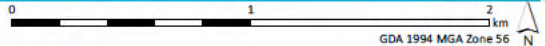
Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 10.1



\\emmsvr1\EMM3\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\EIS_ACHA\ACHA020_PotentialImpacts_20211119_02_FirstPage.mxd 2/4/11/2022



Source: EMM (2022); DFSI (2020); DPIE (2022); GA (2011); SMEC (2022)



- KEY**
- Project area
 - Surveyed Aboriginal site
 - Previously registered AHIMS sites
 - Construction envelope
 - OMPS-BS1
 - Key heritage area
 - Direct impact area
 - Indirect impact area
 - Existing environment
 - Macleay River
 - Watercourse/drainage line
 - Vehicular track
 - NPWS reserve

Potential impacts
Map 4 of 4

Oven Mountain Pumped Hydro Energy Storage Project
Aboriginal cultural heritage assessment
OMPS Pty Ltd
Figure 10.1



\\emmsvr1\EMM3\2021\210465 - OMPS EIS - Generation Component\GIS\02_Maps\Maps_ACHA\ACHA020_PotentialImpacts_20211119_02_FirstPage.mxd 2/4/11/2022

10.5 Cumulative impact and Ecologically Sustainable Development

Ecologically sustainable development, or intergeneration equity, is the principle whereby the current generation should maintain the health, diversity and longevity of the environment for the benefit of future society. For Aboriginal heritage management, intergenerational equity can be considered primarily in terms of the cumulative impacts to Aboriginal objects, sites and/or places in a region. If few Aboriginal objects and places remain in a region (e.g. due to development impacts), there are fewer opportunities for future generations of Aboriginal people and the broader community to enjoy the cultural benefits. Information about the integrity, rarity and representativeness of the Aboriginal objects, sites and places that may be impacted, and how they inform the past visitation and occupation of land by Aboriginal people, are relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of a project. While not directly related to the ACHA process, such (future) impacts are also a critical issue for consideration under the *Native Title Act 1993* (see Attachment A for brief discussion).

Overall, the Project would potentially result in the destruction of 12 identified Aboriginal sites, objects and/or places, as well as various amounts of buried stone or artefactual material (Section 10.3). These consist of three stone arrangements, six culturally modified trees, a quarry site, an artefact scatter and a portion of the broader background scatter. Three further sites, a stone arrangement, grinding groove and quarry, would be inundated and while conserved would be inaccessible into the future. Many of these sites have been assigned a tentative identified status, and further investigation is required to validate them. In the case of the stone artefactual material, three areas of significant buried cultural material would be lost, with several further past foci being partially affected. This amounts to some ~5.74 ha (51%) of known areas of past foci/occupation and considered of moderate scientific and cultural value.

In contrast, the majority of the cultural material documented and/or predicted to be present within the disturbance footprint would only be minimally affected by the Project. This includes several of the sites identified as of moderate and high cultural value by Aboriginal participants, including the avoided stone axe production site, OMPS-AS26, and OMPS-FA7 – the latter where the most substantive cultural materials of the entire Project were recovered. Four of the cultural sites may be adversely affected through view-line and/or hydrological changes, but information on these values to these sites – several of which are already subject to modern activities – has yet to be robustly established, and forms part of the recommendations of this report. It must be highlighted that many of these sites have been avoided wherever possible through numerous project re-designs following the findings of the on-site activities, and a desire by OMPS to ensure their conservation into the future.

While the Project will result in some loss of cultural materials, it must however be acknowledged that increasingly, engagement on this topic is seeking to move beyond the material culture to a more holistic consideration of heritage. Holtorf (2015:412) states:

The acts of changing, destroying or replacing a heritage object in the landscape can all be seen as forms of interpreting, using and transforming this heritage.....The core values of heritage are increasingly deemed to reside in the meanings and values humans invest in heritage objects, not in their physical substance.

And (Holtorf 2015:408):

...maintenance of the status quo of cultural heritage is widely perceived as being superior to any loss or possible substitution of that cultural heritage. But is it really justified in the interest of present or future generations to prioritise the conservation of existing cultural heritage over the prospect of gaining new cultural heritage [or knowledge of, and engagement with, that cultural heritage]?

Holtorf is not alone in his views, with DeSilvey and Harrison (2020:3-5) similarly stating:

These kinds of statements about the future appear to normalise and lend moral weight to the mission of conservation practice, whilst detracting from a consideration of how the salvage paradigm in heritage is fundamentally premised on a system which is equally implicated in the sacrifice and loss of certain less valued cultural and natural formations alongside the preservation or conservation of more valued ones...

Increasingly, heritage scholars are adopting integrated approaches to examine the politics of loss in both cultural and natural heritage contexts. A recent study of the effects of sea level rise on Kiribati, a low-lying island nation in the Pacific Ocean, for example, engages with questions about the extent to which an indigenous, largely oral culture can be 'preserved' outside its 'natural' and dynamic setting.

...point to both the inevitability and the creative potential of loss and change. Such observations seem inescapable for heritage in light of the current recognition of the Anthropocene... it is clear that the more sophisticated ways of understanding, anticipating and engaging forms of heritage loss outlined here point not only to challenging new ways of 'doing' and practising natural and cultural heritage preservation, conservation and management but also map out important new lines of enquiry for heritage studies in the future.

When considering the potential impacts from this perspective, the current and proposed impacts of the Project and associated material culture loss, can be considered to have significant benefits. In the first instance, the investigations of the construction envelope have significantly improved our archaeological and scientific understanding of a previously poorly understood region. Information on the past peopling and their activities within the Project area have now come to light, as well as an improved understanding of contemporary sites and values. Such information will only be added to and further refined through future stages of the Project (see Chapter 11). This Project also provides the Aboriginal community with opportunities to undertake heritage interpretation, development of narratives and visual representation of Aboriginal values, stories and places for the disturbance footprint – something that is currently lacking from the Falls Country region. This would improve understanding and public outreach of cultural heritage to the broader community into the future. The Aboriginal participants have also expressed a desire to remain involved in the Project and continue to access the Project area and visit/maintain the identified Aboriginal sites and places into the future. As such, the Project can enable and support an ongoing connection to Country for the local Aboriginal community, which has previously not been readily available since the early 20th Century. Assuming these opportunities are realised, the Project provides an important continuation and re-imagining of cultural heritage of the region for future generations.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-CS3		Valid	High	Potential Indirect	-	No	No	Partial	Partial loss of value	This site is upstream from the lower reservoir and considered to be unaffected by the Project. There are no view-lines to the homestead however the cultural mapping did not resolve whether it was the homestead itself or other parts of the station as being of value; and hence it has been proposed here as a potential indirect impact until resolved.
OMPS-CS4		Valid	High	Potential Indirect	West of access track	No	No	Partial	Partial loss of value	This site has the potential for view-lines to be adversely affected by the Project, and which may impact its aesthetic values.
OMPS-CS5		Valid	High	Potential Indirect	North of transmission line	No	No	Partial	Partial loss of value	This site has the potential for view-lines to be adversely affected by the Project, and which may impact its aesthetic values.
Georges Creek	#21-5-0023	Valid	High	Potential Indirect	West of access track	No	No	Partial	Partial loss of value	This site is intrinsically linked to the hydrological regime of the Macleay River and may therefore be indirectly affected by the operation of the Project.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-ST1		Tentative	Moderate	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the construction envelope.
OMPS-ST2		Tentative	Moderate	Direct	In close proximity to the EAR	No	No	Whole	Complete loss of value	This is a poorly defined site and encompasses a significant area. The proposed works are not in the vicinity of the historical homestead but may affect parts of the station through installation where post-contact activity has occurred.
OMPS-ST3		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST4		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST5		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST6		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST7		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-ST8		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST9		Tentative	Moderate	Direct	Within transmission corridor	Yes	Yes	Whole	Complete loss of value	
OMPS-ST10		Tentative	Moderate	Direct	Within transmission corridor	Yes	Yes	Whole	Complete loss of value	
OMPS-ST11		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST12		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST13		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST14		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST15		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-ST16		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST17		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST18		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST19		Tentative	Moderate	Direct	Within access track	Yes	Yes	Whole	Complete loss of value	
OMPS-ST20		Tentative	Moderate	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST21		Tentative	Moderate	Direct	Within upper reservoir	Yes	Yes	Whole	Complete loss of value	
OMPS-ST22		Tentative	Moderate	Direct	Within upper reservoir	No	Yes	Whole	Complete loss of value	
OMPS-ST23		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-ST24		Tentative	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-SA1		Tentative	High	Direct	Construction accommodation	Yes	Yes	Whole	Complete loss of value	
OMPS-SA2		Tentative	High	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-SA3		Tentative	High	Direct	Within transmission corridor	Yes	Yes	Whole	Complete loss of value	Depending on the location of towers, this site may be avoided or spanned by the development activities.
OMPS-SA4		Tentative	High	Indirect	Within inundation extent of upper reservoir	Yes	Yes	None	No loss of value	
OMPS-SA5		Tentative	High	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-SA6		Tentative	High	Direct	Within access track	Yes	Yes	Whole	Complete loss of value	
OMPS-AS1 / George's junction Site	#21-5-0142	Valid	High	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-AS1		Valid	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-AS26		Valid	High	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-AS33		Valid	Moderate	Direct	Within access track	Yes	Yes	Whole	Complete loss of value	
OMPS-AS36		Valid	Moderate	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-Q1		Valid	Moderate	Direct	Lower reservoir	No	No	Whole	Complete loss of value	
OMPS-Q2		Tentative	Moderate	Indirect	Within inundation extent of lower reservoir	Yes	Yes	None	No loss of value	
OMPS-R1		Tentative	High	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-R2		Tentative	High	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-GG1		Tentative	Moderate	Indirect	Within inundation extent of lower reservoir	Yes	Yes	None	No loss of value	

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-BS1 (including OMPS-IF1-32 inclusive, and OMPS-AS2 – 25, 27 – 32, 34 – 35, and 37 – 42 inclusive)		Valid	Low	Direct	Entire disturbance footprint	Yes	Yes	Partial	Partial loss of value	This site is considered to extend across the entire construction envelope and extend beyond it. Several discrete observations of this site. Overall, the direct development activities would impact some 330 ha of this site (ie the entire construction envelope).
OMPS-FA1		Valid	Moderate	Direct	Within lower reservoir	Yes	Yes	Whole	Complete loss of value	
OMPS-FA2		Valid	Moderate	Direct	Construction accommodation camp	Yes	Yes	Partial	Partial loss of value	Some 0.78 ha (83%) of the site would be directly impacted by development activities.
OMPS-FA3		Valid	Moderate	Direct	Construction accommodation camp	Yes	Yes	Whole	Complete loss of value	
OMPS-FA4		Valid	Moderate	Direct	Construction accommodation camp	Yes	Yes	Whole	Complete loss of value	
OMPS-FA5		Valid	Moderate	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-FA6		Valid	Moderate	-	-	No	Yes	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-FA7		Valid	High	-	-	No	No	N/A	N/A	This site is situated in close proximity, but outside the disturbance footprint.
OMPS-FA8		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.49 ha (81%) of the site would be directly impacted by development activities.
OMPS-FA9		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.36 ha (60%) of the site would be directly impacted by development activities.
OMPS-FA10		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.28 ha (46%) of the site would be directly impacted by development activities.
OMPS-FA11		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.60 ha (51%) of the site would be directly impacted by development activities.
OMPS-FA12		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Whole	Complete loss of value	
OMPS-FA13		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.22 ha (16%) of the site would be directly impacted by development activities.

Table 10.1 Summary of potential impacts to Aboriginal objects and/or sites within the disturbance footprint

Site	AHIMS #	Status	Significance	Type of harm	Location and/or activity causing harm	Within disturbance footprint	Within construction envelope	Degree of harm	Consequence of harm	Notes
OMPS-FA14		Valid	Moderate	Direct	Partially within access track	Yes	Yes	Partial	Partial loss of value	Some 0.15 ha (16%) of the site would be directly impacted by development activities.
OMPS-FA15		Valid	Moderate	Direct	Partially within EAR	Yes	Yes	Partial	Partial loss of value	Some 0.6 ha (10%) of the site would be directly impacted by development activities.

Notes: The type, degree and consequence of harm definitions are based on DECCW's Code of Practise for the Archaeological Investigation of Aboriginal objects in NSW.

Sites requiring further investigation and/or validation are considered to be of a tentative status and are indicated in red font within the table

11 Management strategy and recommendations

11.1 Key findings

- The ACHA concludes that 44 Aboriginal objects and/or sites are within or near the construction envelope, along with a complex landscape of buried stone artefactual material (Chapter 8). Of the identified sites, up to 19 would be either directly (n=12), indirectly (n=3), or potentially indirectly (n=4) affected by the Project, being within the disturbance footprint. Some 5.74 ha of identified areas of high artefact densities would also be directly affected. Importantly many of the most significant sites and places would be unaffected by the Project, including several significant surface and/or shallowly buried stone artefact scatters.
- A series of investigative actions are proposed to validate the identification of several of the sites that cannot be robustly identified as cultural heritage without specialist input and/or further archaeological research (Section 11.2). General discussion on the methods and approaches to some of the mitigation measures is also undertaken (e.g. the scale and scope of future archaeological excavations).
- Recommendations are proposed for inclusion in the Project approval to guide post-approval requirements for Aboriginal heritage (Section 11.3). These include the development of an Aboriginal Cultural Heritage Management Plan (ACHMP) to provide a framework for such activities, as well as direction on its content; the development of an Interpretation Strategy and Plan to provide acknowledgement and other visual/educational opportunities for the Aboriginal and broader local community; and the application of a Cultural Flow Management Plan to further explore and manage hydrological regimes downstream in relation to an important cultural site (#21-5-0023) and the broader Macleay River.

11.2 Management strategy

The assessment outlined in the preceding sections, and including Aboriginal consultation with 19 organisations, included cultural mapping, field survey and test excavations. Each of these activities identified various areas and locales of archaeological and/or cultural value.

Ultimately, on ratifying this data, some 44 Aboriginal objects and/or potential sites were identified within or near the construction envelope, as well as a complex pattern of surface and buried stone artefactual material along the banks of the Macleay River and Georges Creek. The identified sites consisted of several places of cultural value to the local Aboriginal community (eg Kunderang Station, Georges Junction, increase site, etc.), and a number of archaeological sites dominated by culturally modified trees and stone arrangements. As well as these identified sites, a substantial number of stone artefacts both on the surface and buried within the upper 0.5 m of the soil profile were documented. These were divided into two main zones:

- Fifteen identified locales of high-density cultural material considered of high research potential (OMPS-FA1 – FA15 inclusive) and demonstrating an exploitation of raw material outcrops and pebbles from the river systems over the last 5,000 years. The most significant of these was OMPS-FA7 within which extrapolated values of 8,000 artefacts/m² may be expected.
- The remainder of the construction envelope where a background scatter of artefacts ~16/m² would be expected and considered to reflect the ephemeral use of the region for >5 ka. During the field survey, a number of isolated objects and/or low density artefact scatters were documented separately (Section 7.2.3), but these were ultimately integrated into one of these two classifications.

As outlined in Section 7.3, a small portion of the test excavations are still to be completed due to adverse weather and access conditions at the time of the field program. These are not expected to significantly change the findings of this report but would further involve the disturbance footprint of the EAR, and its potential realignment within the construction envelope. These excavations have been committed by OMPS and form a recommendation of the report.

Of the identified sites, up to 19 would be either directly (n=12), indirectly (n=3) or potentially indirectly (n=4) affected by the Project. Some 5.74 ha of identified areas of high artefact densities would also be directly affected. The indirect impact reflects the inundation of three sites, that would be expected to survive submergence, including a quarry site, grinding groove and stone arrangement. Numerous academic studies demonstrate that, with the exception of the edge of the reservoirs, inundated areas would be relatively unaffected by their submergence. Hence, these sites and deposits are considered to be *conserved* through this process and would be protected from future impacts through their submergence. Three cultural places have also been identified as potentially indirectly affected by the Project, being within sight of the proposed works (OMPS-CS3, OMPS-CS4 and OMPS-CS5) and/or being associated with the streamflow of the Macleay River (#21-5-0023). Given these findings and the potential impacts, additional Aboriginal heritage requirements and mitigation activities are proposed for subsequent stages of the Project and these are incorporated into the recommendations below.

Several of the sites have, however, been identified only tentatively, lacking archaeological features or regional comparisons that would allow their classification as an Aboriginal object or site. These are primarily either culturally modified trees or stone arrangements – both of which can be the result of natural, farming and/or pastoral activities. Given the uncertainty in relation to these sites, it is recommended that additional specialist investigations are undertaken prior to the project commencement to clarify their status, and ultimately the management of these sites. Such analysis should include, but not be limited to:

- Culturally modified trees – these trees should be subject to inspection by an arboricultural consultant to provide further advice. Typically, an arboriculturist would provide advice on the age of the tree – having to be at least 130 years old to intersect with known traditional tree scarring practises – and identify whether natural mechanisms may explain the scar in question. Where a natural explanation can be identified, the site can be discounted as an Aboriginal site and would no longer form a potential constraint to the project. Where the arboriculturist cannot provide a natural explanation, it provides increasing evidence that the site is of cultural origin and should be treated as an Aboriginal site with suitable management and mitigation measures.
- Stone arrangements – determining stone arrangements, which are often dominated by local unmodified raw materials, can be highly problematic. Two methods to further interrogate these sites may include: 1) a comparative analysis with other documented Aboriginal stone arrangements in the local and broader region to identify similar characteristics and composition to validate an anthropogenic origin; and 2) analytical field investigations of the site, which should include the detailed measurement of stone raw materials – larger and consistent sizing being more likely of Aboriginal origin, in contrast to pastoral activities, which more commonly bulldoze or plough all stone material encountered; and the partial deconstruction of the stone arrangement to identify any indications of an Aboriginal origin through the nature of the construction and any other cultural material that may be within the site.

In NSW, Aboriginal objects are provided with statutory protection by the *National Parks and Wildlife Act 1974*. In general, where a proposed activity will result in harm to an Aboriginal object, an application must be made, and an Aboriginal Heritage Impact Permit (AHIP) must be granted before any harm may occur. If granted, the AHIP will contain conditions intended to manage and mitigate the identified impact and allowing harm to proceed. As the Project is a CSSI project, an AHIP is not required. The identified harm and any mitigation measures will instead be assessed through the EIS and, if consent to harm is granted, included within the Project's conditions of approval. The conditions of approval of a CSSI project generally incorporate Aboriginal heritage management requirements based on advice from Heritage NSW, and the recommendations of this assessment (Section 11.3).

For the purposes of this Project, recommendations below include the further validation of the tentative site listings (Appendix F.2), and the development of an Aboriginal Cultural Heritage Management Plan (ACHMP) to provide the post-approval management framework for all future Aboriginal heritage requirements for the Project. The recommendations also outline the further specific mitigation measures to be included in the ACHMP that should be implemented prior to, during and after the project construction. These include measures to further explore the potential impacts and management of view-line changes for OMPS-CS3-CS5 inclusive, investigate and salvage or relocate (conservation *ex situ*) areas of high research potential (OMPS-FA1-FA15 inclusive where being adversely affected), archival recording of all identified sites subject to impact, any other recovery and/or collection procedures, implementing suitable monitoring and management of lesser impacts, completing any post-excavation analyses and reporting, and lodging the various documentation with appropriate public repositories.

Given the potential of complete or partial destruction of 12 zones of high artefact densities, it is recommended that these are subject to additional excavations and recovery (conservation *ex situ*). Given some of these foci will be relatively unaffected, these works should focus on OMPS-FA1, OMPS-FA3, OMPS-FA4 and OMPS-FA12 that are all subject to direct impacts. However, OMPS-FA2, OMPS-FA3, OMPS-FA4, OMPS-FA8, OMPS-FA9, OMPS-FA10, OMPS-FA11, and OMPS-FA13-15 inclusive should also be considered for proportionate excavation given their inaccessibility into the future. The additional excavations at these sites have the full support of the Aboriginal participants in the Project. While the specific methodologies and quantum of these excavations would be developed as part of the ACHMP in consultation with the Project team and Aboriginal participants, a number of guiding principles should be adopted, including:

- Investigative phase – the excavations undertaken as part of the ACHA were disparate and widely spaced to maximise investigation of the disturbance footprint. As such, an additional stage of investigative test pits across the areas of high artefact density is needed to identify places within its curtilage that contain the most significant parts of the deposit. Such works should use a high-resolution systematic grid of test pits spaced 20-30 m across targeted sections of the sites disturbance footprint. Excavations should be undertaken manually in discrete test pits (1 m²), use 10 cm spits for recovery, dry-sieve all sediment through a 5 mm mesh, recover suitable palaeo environmental and chronological sampling, and undertake appropriate recording.
- Salvage phase – once the test pits containing the highest significance are identified, archaeological salvage excavation (conservation *ex situ*) of the area/s should be undertaken. Depending on the number of high value locales and the nature of the impacts, salvage excavation may focus on some or all of these test pits. In accordance with current best practice, all salvage works should consist of initially 25 m² of contiguous open area excavation centred on the test pit/s of interest and expanding up to 100 m² where suitable thresholds are met (e.g. continuing high density of artefact numbers, unique characteristics, etc). Excavations should be undertaken manually in discrete test pits (0.25–1 m²), use 5 cm spits for recovery, wet sieve all sediment through a 3 mm mesh, recover suitable palaeo environmental and chronological sampling, and undertake appropriate recording.
- Post-excavation analysis and reporting – a suitable program of analysis of the recovered samples and assemblage should be undertaken and reported upon to provide ‘preservation by record’. Analysis should include processing of chronological samples (e.g. optically stimulated luminescence, radiocarbon), palaeo environmental samples (e.g. particle size, geochemistry, pollen analysis, etc), and stone tool analysis. The potentially long construction timeframes of this project significant increase the risk of cultural materials being lost or misplaced, and as such as part of the post-excavation analysis of any works, the short and long term curation of any cultural materials needs to be suitably discussed and documented.

In the case of the background artefact scatter, no further mitigation measures are recommended. It has been demonstrated that ~16 artefacts/m² would be expected across the construction envelope, which reflects the ephemeral use of the region by Aboriginal people for several millennia. It is considered that further investigation of these areas would not alter the significance or understanding of these cultural deposits.

In addition to the tangible cultural materials within the disturbance footprint, a wide range of intangible and cultural values were identified. This includes the need to determine whether any adverse impacts from temporary and/or permanent landscape view changes in relation to nearby cultural places; and the need to understand and maintain cultural flows of Macleay River, and especially any adverse impacts to the increase site downstream of the lower reservoir. Given this focus during the consultation process, and the potential impact to cultural sites and social history places, three further mitigation activities are included in the recommendations:

1. On-Country discussions with Elders and key- knowledge holders (Appendix D) to discuss the potential impacts of the Project to any key view-lines of the Kunderang Station⁵, George's Creek Camp, Lower Flat/Long Station Camp, and any other identified sites or places in the vicinity of the disturbance footprint where similar concerns may be expressed. These discussions should be undertaken by an anthropologist assisted by OMPS and include: i) clear identification of any impacts by the works; ii) identify suitable mechanisms to reduce or remove identified impacts through design optimisation, temporary or permanent screening, and/or other agreed methods. These discussions and outcomes should be suitably documented in the ACHMP.
2. The development of an interpretation strategy, interpretation plan, and their implementation to explore, develop and present Aboriginal heritage values of the Project area. These documents should focus on three main areas of Aboriginal heritage: (i) the ethnographic and historical record, which includes post-Contact and contemporary associations with the site and immediate environs; (ii) consultation and input from the RAPs (with feedback to date focussing on the importance of Georges Junction and the relationship of the Thunggutti people with the Macleay River, endemic plants to form part of any landscaping, and for consideration of other contemporary connections to the region, etc); and (iii) information obtained from the archaeological excavations and findings undertaken for the Project on the cultural and environmental landscape within which past Aboriginal people interacted with in the past.
3. Water for the initial filling of the reservoirs and for top ups is proposed to be taken from the Macleay River through a Specific Purpose Access Licence (SPAL) under the NSW *Water Management Act 2000*. The SPAL will contain conditions which limit the overall volume of water that can be taken from the river, and it is expected that it will contain conditions which limit times and volumes that water can be extracted based on flows in the river. Consideration of cultural flows of the Macleay River and Georges Creek – and with a focus on the increase site, #21-5-0023 – should be given when developing the application for the SPAL. This might include a compilation of cultural and environmental information about these river systems, consideration of the specific cultural values and places affected by water flows and consideration of the requirement of water flows to maintain their cultural integrity.

⁵ Note that a formal Landscape visual impact assessment was undertaken by EMM as part of the EIS and did not identify any visual impacts to Kunderang Station homestead. However, it is unclear from the discussions to date whether the cultural values of Kunderang Station related solely to the homestead or other parts of the property. Therefore it has been included here for further investigation during subsequent stages of the project.

11.3 Recommendations

Where feasible, OMPS should consider modifying the Project design and disturbance footprint to avoid identified Aboriginal objects and/or sites identified and areas of significant buried cultural material (or where they have a high likelihood of being present) within the disturbance footprint.

Where altering the design is unfeasible, the following recommendations should be integrated into the management for the Project:

- Prior to granting of any Project approval, the archaeological test excavation proposed in Section 7.3 of the ACHA must be completed. Due to unprecedented weather conditions, the program could not be completed prior to the completion of this report. While it is not considered that the findings of these additional works would result in fundamental changes to the findings or recommendations of the ACHA, they nonetheless are required to inform the final designs of the eastern access road.
- Prior to construction ground disturbance, an Aboriginal Cultural Heritage Management Plan (ACHMP) must be developed by a heritage specialist in consultation with the Registered Aboriginal Parties (RAPs) and consent authority to provide the post-approval framework for managing Aboriginal heritage within the Project area. The ACHMP should include the following issues:
 - Processes, timing, communication methods and Project involvement (e.g. on-site activities) for maintaining Aboriginal community consultation and participation through the remainder of the project. This should include a grievance mechanism that is readily available and designed for use by the local Aboriginal community.
 - If not previously completed, discuss and identify any areas of design optimisation with the RAPs to avoid or further minimise harm to identified Aboriginal sites, objects and place.
 - If not previously completed and where necessary, provide descriptions and methods for undertaking further investigation and assessment of the sites currently assigned a tentative classification (OMPS-ST1-24 inclusive, OMPS-SA1-6 inclusive, OMPS-Q2, OMPS-R1 and R2, OMPS-GG1) to gain a comprehensive understanding of these sites for subsequent management through construction of the Project.
 - If not previously completed, provide descriptions and methods for undertaking on-Country meetings with the Elders and key knowledge-holders to discuss any potential view-line impacts of the Project and places of cultural value (OMPS-CS3-CS5 inclusive, etc), and their subsequent management.
 - Detail descriptions and methods of any additional investigative and/or mitigative archaeological actions that may be required prior to construction works commencing or during the Project. These should include, but not limited to, archival recording of all identified Aboriginal objects, sites and places; suitable recovery or relocation, documentation and analysis of any archaeological sites proposed for direct impacts (OMPS-ST2, OMPS-ST9, OMPS-ST10, OMPS-ST19, OMPS-ST21, OMPS-ST22, OMPS-SA1, OMPS-SA3, OMPS-SA6, OMPS-AS33, OMPS-Q1, OMPS-BS1); management of any archaeological excavation of areas of significant buried cultural material (OMPS-FA1-15 inclusive) and where direct impacts are proposed; and/or cultural monitoring for any areas identified by Aboriginal community as having significant cultural value. Further details of these activities are presented in Section 11.2. For these activities, details of location/s, methods, personnel, and timing should be included.

- Description and methods of actions to minimise any inadvertent impacts to identified Aboriginal objects and/or sites and areas of archaeological sensitivity outside of the disturbance footprint. This should include, but not be limited to, cultural inductions for all personnel and subcontractors outlining their location and significance, fencing and clear marking of heritage sites and zones of interest in close proximity to proposed works, appropriate screening for sensitive and gender-specific areas, and any additional requirements identified by the Aboriginal community. A suitable regime of monitoring these activities should also be outlined, including locations, methods, personnel and timing.
 - Description and methods for undertaking further Aboriginal heritage assessment, investigation and mitigation of any areas of the disturbance footprint that have changed following completion of the ACHA and/or during the final design and construction phases of the Project.
 - Description and methods of post-excavation analysis and reporting of the archaeological investigations and activities implemented as part of the ACHMP. For excavations, these should include suitable collection and processing of stone artefacts, and chronological, soil, and environmental samples.
 - Procedures for managing the unexpected discovery of Aboriginal objects, sites and/or human remains during the Project.
 - Procedures for the curation and long-term management of cultural materials recovered or relocated as part of the works outlined in the ACHMP and any preceding stages associated with the Project.
 - Processes for reviewing, monitoring, and updating the ACHMP as the project progresses.
- A heritage-interpretation strategy must be developed by a heritage specialist to identify the interpretive values of the Project area, and specifically Aboriginal heritage values across the construction envelope, and to provide direction for potential interpretive opportunities for the Project. This strategy should be made available for consultation and feedback with the RAPs. Following consultation and feedback on the strategy, a heritage interpretation plan would refine the strategy with content (visual and textual) and design details in order to allow the implementation stage. The interpretation strategy and interpretation plan must include consideration of three main components identified through the ACHA process:
 - Input and feedback from the RAPs, which to date include a number of cultural, historical and social history places from both traditional and contemporary connection of the Project area with the Aboriginal community; and a range of flora and fauna that have totemic, medicinal and/or economic association with the Aboriginal community.
 - The historical record of the study and its immediate environs, which has documented associations with Aboriginal people, dating to the post-Contact period.
 - The past cultural and environmental landscape informed by current archaeological investigations and analysis of the ACHA, and any future activities that may result from the Project (e.g. archaeological salvage of key locales).

- Water for the initial filling of the reservoirs and for top ups is proposed to be taken from the Macleay River through a SPAL under the NSW *Water Management Act 2000*. The SPAL will contain conditions which limit the overall volume of water that can be taken from the river, and it is expected that it will contain conditions which limit times and volumes that water can be extracted based on flows in the river. Given the importance placed on the Macleay River and Georges Creek by the local Thunggutti people, and the identification of a significant cultural site downstream of the lower reservoir, the application for the SPAL should consider cultural flows of the Macleay River. This might include the following:
 - A background description of the Aboriginal sites, objects, places and values, and their significance; and information on how water influences their significance and integrity. This may require additional investigations if there are impacts identified to Aboriginal sites, objects, places and values that are not addressed in the ACHA.
 - An overview of the catchment or river systems, including hydrological information from prior to establishment of the dams and reservoirs.
 - Clear objectives for the cultural flow in maintaining the significance of the Aboriginal sites, objects, places and values.
 - Description of how water will be managed into the future to maintain necessary water regimes; and any constraints/limitations.
- The Construction Environment Management Plan (CEMP), or equivalent, should reinforce how the cultural landscape is considered throughout the Project and detail the rehabilitation of the disturbance footprint. Rehabilitation of areas where infrastructure is not remaining after construction of the Project should be undertaken to determine suitable ecological communities and other factors in returning the cultural landscape as close to its current state as feasible.
- Consultation should be maintained with the RAPs during the finalisation of the assessment process and throughout the Project.
- A copy of the ACHA should be lodged with AHIMS and provided to each of the RAPs.
- AHIMS Site Recording Forms for the newly identified Aboriginal objects and/or sites within the Project area and areas of archaeological sensitivity should be submitted to the AHIMS database once their validation has been completed.
- Where the heritage consultant changes through the Project, suitable hand over should be undertaken to minimise loss or mistranslation of the intent of the information, findings and future steps in heritage management occur.

References

Australian Museum Business Services (AMBS), 2013, *Tenterfield LGA: Aboriginal Heritage Study*, report for Tenterfield Shire Council.

Blomfield, G 1981. Baal Belbora: the end of the dancing: the agony of the British invasion of the ancient people of three rivers, the Hastings, the Manning & the Macleay, in New South Wales. APCOL, Chippendale, N.S.W.

Calvert, J, 1845, Mineral Topographical Survey of the five northern districts of NSW M.S.

Campbell, J. 1932. The Kunderang Ravines of New England. Journal and proceedings of the Royal Australian Historical Society, Vol. 18, No.2, pp. 63-73.

Code of Practise for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010)

Cohen, B 2015. Caring for Carrai and Kunderang Cultural Camps. Prepared for Department of Environment and Heritage.

Collaborative Solutions, 2002, Assessment of Significance for Aboriginal Place Declaration: Flat Camp Cemetery and Morgue. Report prepared for New South Wales National Parks and Wildlife Service.

Creamer, Howard, F. (1979-)1981. Berarngutta to Gulgarng: Investigations of Aboriginal Sites of Significance from Point Lookout to South West Rocks. National Parks and Wildlife Services NSW Aboriginal Site Survey. Unpublished report.

- 1977. Malaise and Beyond. In Peter Stanbury (ed.) *The Moving Frontier: Aspects of Aboriginal-European Interaction in Australia*, Reed, Terry Hills, pp. 147-155.
- 1975. From the 'Cultural Bind' to a Solution the Survey of Aboriginal Sacred Sites in New South Wales. *Australian Archaeology*, No.2, pp.17-23.
- 1974. Survey of Aboriginal Sites in New South Wales: The Carrai Waterholes. Unpublished report.

DNAAG Aboriginal Art Gallery 2022, Burrell Bulai – Barralbarayi, accessed 13 October 2022, <https://www.dnaag.com.au/two-views-of-an-important-local-site/>

Davies, S.J., Stewart-Zerba, A., Crengle, S., Lamb, S. and Prangell 1993. The University of Queensland Archaeological Services Unit Report No 232: An Archaeological Assessment of the State Forest of New South Wales Walcha-Nundle and Styx River Management Areas. Prepared for Mitchell McCotter.

EMM Consulting Pty Ltd 2021. Oven Mountain Pumped Hydro Storage Project - Geotechnical DA - Aboriginal heritage site inspection results and recommendations. Prepared for OMPS Pty Ltd.

Empire, 22 December 1862, "Advertising.", p.6. <http://nla.gov.au/nla.news-article60520590>.

Enright, W.J. 1937. Notes on the Aborigines of the North Coast of New South Wales. *Mankind*, Vol.4, No.2, pp.88-91.

Erskine, J and Moorehouse, K, 1999, *Torrington State Recreation Area: A Report on the Aboriginal Cultural Significance*. Unpublished report prepared for the Glenn Innes District of New South Wales Parks and Wildlife Service.

Frost, L, 1992, *A Face in the Glass: The Journal and Life of Annie Baxter Dawbin*, William Heinemann Australia.

Giggs, J., Greenwood, L. M. and Lea, D. 1977. Population, in J. Giggs, L.M. Greenwood and D. Lea (eds.) *An Atlas of New England*, Vol. 2 - The Commentaries, Department of Geography, University of New England, Armidale, pp. 183-216.

- Godwin 1990. Inside Information: Settlement and alliance in the late Holocene of northeastern New South Wales. PhD diss., University of New England.
- Hall, G. 1977. The Road to the River (1839-1939) or Draylines to Deep Water. Bording's Publications, Lismore.
- Harrison, Rodney 2004. Shared Landscapes: Archaeologies of Attachment and the Pastoral Industry in New South Wales. UNSW Press, Sydney.
- Jill Sheppard Heritage Consultants (JS Heritage) 2003. Kunderang East Pastoral Station: Oxley Wild Rivers National Park Conservation Management Plan. Prepared for NSW National Parks and Wildlife Service Cultural Division and Armidale Area.
- Kelly, Ray 1975. From the 'Keeparra' to the 'Cultural Bind'- An Analysis of the Aboriginal Situation. Australian Archaeology, Vol. 2, No. 1, pp.13-17.
- Kelly, Shay 1989. The Traditional Life Lived by the Dunggutti People of the Macleay River Region in New South Wales, Unpublished essay, Department of Community Programs, University of Newcastle.
- Knuckey, Graham 2016. Carring for Carrai and Kunderang Country: Physical Evidence of Traditional Links in the New England County Gorge Country, NSW National Parks and Wildlife working together with Traditional Owners in the Upper MacLeay River Valley. Prepared for NSW National Parks and Wildlife Service.
- Macleay Argus, 9 October 1925, Gathering of Aborigines, p.2 <http://nla.gov.au/nla.news-article234061310>
- 18 November 1927, Maynard's Mischievous Mis-statements, p.5 <http://nla.gov.au/nla.news-article234365543>
- Macleay River Historical Society 2002, Kempsey Shire Community Based Heritage Study: Thematic History. Prepared for Kempsey Shire Council.
- Maynard, John 2005. For Liberty and Freedom Fred Maynard and the Australian Aboriginal Progressive Association, Teaching History, Vol. 39, No.1, pp. 6-12.
- 2003. Vision, voice and influence: The rise of the Australian aboriginal progressive association, Australian Historical Studies, Vol. 34, No.121, pp.91-105.
- McDonald, Barry 1996. Evidence of four New England corroboree songs indicating Aboriginal responses to European invasion, Aboriginal History, Vol. 20, pp.176-194.
- Moran, C. 2004. Talk softly, listen well: profile of a Bundjalung elder Charles Mora. Southern Cross University Press, Lismore.
- Morris, Barry 1989. Domesticating Resistance: The Dhan-Gadi Aborigines and the Australian State. 2020 ed. Routledge: Abingdon.
- National Museum of Australia (NMA) 2022, Defining Moment: Myall Creek massacre, accessed 13 October 2022, <https://www.nma.gov.au/defining-moments/resources/myall-creek-massacre>
- Neil, M.H. 1972. Valley of the Macleay. Wentworth Books, Sydney.
- NSW State Archives and Records 2022, Records of 19th Century blanket lists and returns of Aboriginal people, NSW Government, accessed 14 October 2022 <https://www.records.nsw.gov.au/archives/collections-and-research/guides-and-indexes/19th-century-blanket-lists-and-returns-of-aboriginal-people>
- 2010, Aboriginal Resources: An Overview of Records, NSW Government, accessed 14 October 2022, <https://www.records.nsw.gov.au/archives/collections-and-research/guides-and-indexes/aboriginal-resources-overview-records>
- NSW Aboriginal Land Council 2022. Thunggutti LALC, https://alc.org.au/land_council/Thunggutti/

New South Wales Government Gazette, 18 November 1845, "Pasturage Licenses.", p.1294.

<http://nla.gov.au/nla.news-article230690220>.

- 17 October 1848, "Transfers of Runs.", p.1475. <http://nla.gov.au/nla.news-article230150261>.

NSW National Parks and Wildlife Service (NPWS) 2008. Carrai National Park and Carrai State Conservation Area: Plan of Management. Prepared for the Minister for Climate Change and the Environment.

- 2005. Oxley Wild Rivers National Park, Oxley Wild Rivers State Conservation Area, Cunnawarra National Park And Georges Creek Nature Reserve. Prepared for the Minister for Climate Change and the Environment.

Quinlan, M., and E. Eckerman 1983, Bellbrook: My Father's Country. Aboriginal History, Vol.7, pp. 34–46.

Rich, Elizabeth 1990. Aboriginal Historic Sites in North East NSW: Management Study. Prepared for NSW NPWS and The Australian Heritage Commission.

Rutledge, Martha 1976, Thornton, George (1819–1901), Australian Dictionary of Biography online [2006], accessed 14 October 2022, <https://adb.anu.edu.au/biography/thornton-george-4720>

State Archives and Records of NSW 2021, Crown Lands Occupation Guide. 15 July 2021.

<https://www.records.nsw.gov.au/archives/collections-and-research/guides-and-indexes/crown-lands-occupation-guide>.

The Sydney Gazette and New South Wales Advertiser 20 May 1826, "Australasian Politics.", p.3.

<https://trove.nla.gov.au/newspaper/article/2185842/495879#>.

The Sydney Herald, 10 July 1840, "McLeay River. — Outrage by the Blacks.", p.5.

<https://trove.nla.gov.au/newspaper/article/12864325/1523969#>.

The Sydney Morning Herald (SMH), 12 June 1843, News from the Interior, p.2. <http://nla.gov.au/nla.news-article12426537>

- 20 June 1843, River McLeay, p.3. <http://nla.gov.au/nla.news-article12408511>
- 26 July 1848, "Claims to Leases of Crown Lands Beyond the Settled Districts.", p.3. <http://nla.gov.au/nla.news-article12904340>
- 15 November 1927, Aborigines, p.11 <http://nla.gov.au/nla.news-article16418863>

Tindale, Norman B. 1974. Aboriginal tribes of Australia: their terrain, environmental controls, distribution, limits, and proper names. ANU Press, Canberra.

The University of Newcastle 2019, Colonial Frontier Massacres, Australia, 1780 to 1930, V3.

<https://c21ch.newcastle.edu.au/colonialmassacres/map.php>.

Weingarth, J. 1921. The Discovery and Settlement of the Macleay River. Journal and Proceedings of the Royal Society of New South Wales Royal Australian Historical Society, Vol.2, No.4, pp.175-198.

Abbreviations

AHD	Australian Height Datum
ACHA/ACHAR	Aboriginal cultural heritage assessment report
AHIMS	Aboriginal Heritage Information Management System
ACHMP	Aboriginal Cultural Heritage Management Plan
AMBS	Australian Museum Business Services
BP	Years before present
c.	circa
cm	centimetres
DEC	Department of Environment and Conservation, now DPC
DECCW	Department of Environment Climate Change and Water, now DPC
DPC	Department of Premier and Cabinet
DPE	Department of Planning and Environment, now DPIE
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMM Heritage	EMM Consulting
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ERM	Environmental Resources Management
ESD	Ecologically sustainable development
FGS	Fine grained siliceous
g	grams
GIS	geographical information system
GPS	global positioning system
ha	hectare
ICOMOS	International Council on Monuments and Sites
IMTC	Indurated mudstone/tuff/chert
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
m	metres
m ²	square metres
mm	millimetres

n	Number
NIAC	Northern Illawarra Aboriginal Collective Inc
NSW	New South Wales
OEH	Office of Environment and Heritage, now DPIE
PAD	Potential archaeological deposit
PLALC	Pejar Local Aboriginal Land Council
RAP	Registered Aboriginal Party
SEARs	Secretary's Environmental Assessment Requirements
t	Tonne
TEC	Total Earth Care
TP	Test pit
WSC	Wingecarribee Shire Council

Glossary

Many of these definitions have been taken from the *Code of Practice for archaeological investigation of Aboriginal objects in NSW* (DECCW 2010).

Aboriginal object: A physical manifestation of past Aboriginal activity. The legal term is defined in the *National Parks and Wildlife Act 1974* section 5 as: any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

Typical examples include stone artefacts, grinding grooves, Aboriginal rock shelters which by definition include physical evidence of occupation, midden shell, hearths, stone arrangements and other landscape features which derive from past Aboriginal activity.

Archaeological survey: A method of data collection for Aboriginal heritage assessment. It involved a survey team walking over the land in a systematic way, recording information. Activities are not invasive or destructive.

Aboriginal culturally modified tree: A tree of sufficient age to have been mature at the time of traditional Aboriginal hunter-gatherer life and therefore generally of more than 220 years ago with evidence of bark or cambium wood removal for the purpose of implement manufacture, footholds, bark sheet removal for shelter, or extraction of animals or other food. Care must be taken to distinguish Aboriginal scars from the much more common natural causes of branch tear, insect attack, animal impact, lightning strike and dieback. Culturally modified tree recognition guidelines exist to distinguish these features. Naturally scarred trees are often misidentified as Aboriginal culturally modified trees.

Aboriginal site: The location where a person in the present day can observe one or more Aboriginal objects. The boundaries of a site are limited to the extent of the observed evidence. In the context of this report a 'site' does not include the assumed extent of unobserved Aboriginal objects (such as archaeological deposit). Different archaeologists can have varying definitions of a 'site' and may use the term to reflect the assumed extent of past Aboriginal activity beyond visible Aboriginal objects. Such use of the term risks defining all of Australia as a single 'site'.

Aboriginal stone artefact: A stone object with morphological features derived from past Aboriginal activity such as intentional fracture, abrasion or impact. Artefacts are distinguished by morphology and context. Typically flaked stone artefacts are distinguished from naturally broken stone by recognition of clear marginal fracture initiation (typically herzian/conchoidal or wedging initiation) on highly siliceous stone types which can often be exotic to the area. Care must be taken to distinguish modern broken stone in machine impacted contexts and therefore context must be carefully considered as well as morphology.

Aggradation: a term used in geology for the increase in land elevation, typically in a river system, due to the deposition of sediment.

AHIMS: Aboriginal Heritage Information Management System — a computer software system employed by the Office of Environment and Heritage to manage many aspects of Aboriginal site recording and permitting. AHIMS includes an Aboriginal sites database which can be accessed via an internet portal.

Archaeological deposit: Aboriginal objects occurring in one or more soil strata. The most common form of archaeological deposit relates to the presence of a single conflated layer of Aboriginal stone artefacts worked into the topsoil through **bioturbation**.

Backed artefact: A thin flake or blade-flake that has been shaped by secondary flaking (**retouch**) along one lateral margin. The retouched margin is typically steep and bipolar to form a blunt 'back' in the manner of a modern scalpel blade. Distinctive symmetrical and asymmetrical forms are typically found called geometric **microliths** and Bondi points respectively. A thick symmetrical form, called an Elouera, is typically the size of a mandarin segment.

Bioturbation: is the reworking of soils and sediments by animals or plants. Its effects include changing texture of sediments (diagenetic), bioirrigation and displacement of microorganisms and non-living particles.

Bipolar flaking: Where the stone to be worked is rested on an anvil or other stone before being hit by the hammerstone. This results in the presence of negative flake scars on both ends of the core.

Bondi point: See backed artefact definition.

Brown podosols: Topsoils have loamy textures. A2 horizons are common, there is a clear boundary onto the B horizon. They have a sandy clay to heavy clay texture (typically occur on upper and mid-slopes).

Chocolate Soils: Soils that are typically formed in a basaltic parent material where slope or bedrock strata influence drainage. Surface horizons comprise loam, clay loam or silty clay loam. There is a gradual boundary to a brown or brownish black B horizon. There is no A2 horizons.

Conchoidal: A term used in relation to fracture surfaces on Aboriginal stone artefacts - bulb-like in the manner of a bulbous protrusion on a bivalve shell.

Elouera: See backed artefact definition.

Erailure scar: The small flake scar on the dorsal side of a flake next to the platform. It is the result of rebounding force during percussion flaking.

Exposure: estimates the area with a likelihood of revealing buried artefacts or deposits, not just an observation of the amount of bare ground.

Geometric microlith: See backed artefact definition.

Grinding grooves: Grinding grooves typically derive from the sharpening of stone hatchet heads on sandstone rock. Grooves appear as elliptical depressions of around 25 cm length with smooth bases. Although mostly occurring in association with water to wash the abraded stone dust away from the groove, such sites have been recorded away from water. Narrow grooves or broad abraded areas may occur less commonly and may be derived from spear sharpening or other grinding activities.

Haematite: a pigment featured in ochre used for tinting with a permanent colour.

Holocene: A period of time generally 10,000 years, which marks the end of the last ice age, to the present.

Igneous: relating to or involving volcanic or plutonic processes.

Indurated mudstone/tuff (IMT): the fine textured, very hard, yellowish, orange, reddish-brown or grey rocks from which stone artefacts are made.

Isotropic: Having a physical property that has the same value when measured in different directions. In relation to stone used for stone tools a fracture path is not hindered by layer boundaries or other favoured plane of cleavage.

Keeping place: A room or facility with the express and exclusive purpose of storing Aboriginal cultural heritage materials with accompanying documentation in a secure and accessible manner which protects their cultural heritage values.

Knapping: This term is used in reference to stone tool production. Specifically it relates to the production and shaping of a block of stone (eg a cobble) into a stone tool. The process is called knapping, while the individual undertaking the task is often called a knapper. A knapping floor or event often referenced in the literature relates to an archaeological deposit, usually of high densities of stone artefacts, where researcher's believe this process has occurred in a given locale.

Krasnozems: Mainly loams, clay loams and silty clay loams with a clear or gradual boundary to a dark reddish brown B horizon. Clays are typically light to medium and occasionally heavy.

Lithosols: Soils that have little or no profile development. They occur on steep slopes and are usually shallow and are left mainly as uncleared native bushland.

Microlith: Very small fragments of flakes retouched into geometric shapes and usually present on tools like barbed spears, arrows and sickles.

Midden: A collection of shells and associated economic remains resulting from Aboriginal food gathering and processing activity. Middens comprise shellfish remains of consistent size in a rich dark earth matrix commonly associated with stone artefacts, fish bone and animal bone although shells are commonly the most obtrusive element.

Open stone artefact site/stone artefact site: An unenclosed area where Aboriginal stone artefacts occur – typically exposed from a topsoil archaeological deposit by erosion. Typically the term is used to refer to two or more artefacts although this is an arbitrary distinction. A general ‘rule of thumb’ boundary definition employed by archaeologists is that artefacts or features more than 50 m apart are regarded as separate sites, however there is no theoretical imperative dictating such as rule. (The 50 m separation rule is used for the most part in EMM’s work).

Pirri point: A leaf-shaped stone implement with unifacial retouch extending from the lateral margins to a central keel running the length of the dorsal surface.

Pleistocene: A period of time 2.6 million years ago to 10,000 years ago. Reference to ‘Pleistocene sites’ generally means reference to sites older than 10,000 years.

Podosols: Soils with accumulations of organic matter, iron and aluminium. They are usually sand textured to depth. Yellow and red podosols are generally acid neutral. Yellow podosols have coarse to medium textured A horizons.

Point cluster: A group of GPS points used to identify the locations of individual artefacts in the field.

Potential Archaeological Deposit (PAD): An area where there is an inferred presence of Aboriginal objects in the soil based on the environmental context which is typically associated with discovery of Aboriginal objects in analogous areas. This is not strictly a ‘site’ type, although AHIMS records it as such for the purpose of associating Aboriginal heritage Impact Permits with geographical areas.

Red podosols: Podosols with a pronounced texture contrast and clear to abrupt boundaries between A and B horizons. A2 is often massive and gravelly.

Retouch: The modification of the edges of a flake or tool by the removal of a series of small flakes.

Siliceous Sands: Sands that are usually found on coarse-grained sandstones and in sandstone colluvium. They are often sandstone outcrops present in the landscape. The topsoil has a loamy sand to light sandy clay.

Scarp: a steep slope characterised by outcropping bedrock. In this report, scarp refers to a combination of landform elements including scarp foot slopes, scarps, and cliff lines where outcropping sandstone is present in the landscape 10% and above.

Spit/s: This term reflects an arbitrary unit of depth that archaeologists excavate when lacking evidence of a stratigraphy within the soil profile. Commonly, archaeologists remove vertical intervals of 5, 10 or 20cm, each representing a spit, down the soil profile. Through this process, archaeologists can determine the depth at which archaeological materials are found, even in soil profiles with no clear divisions or boundaries.

Spur: the lateral crests of land that descend from the summit of hills or ridges. Spurs typically extend, with decreasing elevation, closer to streams and valley floors than the main crest of a hill.

Taphonomic: the events and processes, such as burial in sediment, leading to the degradation, decomposition or preservation of objects.

Thumbnail scraper: A thumbnail sized thin flake with steep unidirectional retouch or use-wear around a convex working edge.

Transect: A sample unit which is walking line or corridor across the project area.

Upsidence: phenomena that occurs when mining approaches and undermines river valleys. It can result in cracking and buckling of river beds and rock bars and localised loss of water flow.

Visibility: The amount of bare ground on exposures which might reveal artefacts or other archaeological materials.

Yellow earths: predominantly sandy-textured soils with earthy porous fabric, weak profile differentiation and gradual or diffuse boundaries except for the darker A1 horizon.

Yellow podosols: Podosols which typically occur on the upper slopes of steep landscapes and on the mid to lower slopes of others. The A2 soil horizon is present in most profiles and the boundary change to the B horizon is generally clear. The B horizon is typically sandy clay to heavy clay.

Appendix A

Legislative context

A.1 Commonwealth

A.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* preserves and protect areas (especially sacred or intangible sites) and places of particular significance to Aboriginal people from damage or destruction. Steps necessary for the protection of a threatened place are outlined in a gazetted Ministerial Declaration (Chapters 9 and 10); and which can result in a cessation of any development activity.

In addition, the Act also protects objects by Declaration, notably Aboriginal skeletal remains (Section 12 of the ACT). This can be applied at a State level where a State is unwilling or unable to provide such protection.

A.1.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* provides for protection of natural and cultural heritage places. The Act establishes a National Heritage List (NHL) and a Commonwealth Heritage List (CHL) upon which places of natural or cultural significance can be listed. Sites at a national level and can be in public or private ownership. The CHL is limited to places owned by the Commonwealth, and most frequently encompass Department of Defence sites. Sites and places listed on the NHL are considered to be of State and local heritage value, even if they are not listed or documented as such at a State level.

The values of sites and places on the NHL/ CHL are protected under the EPBC Act. The Act requires that the Minister administering the Act assess any action which has, will have, or is likely to have, a significant impact on the heritage values. Where relevant, a referral is made to the relevant Commonwealth Department, and either approval, approval with controls, or rejection of the proposed action is determined.

A.1.3 Native Title Act 1993

The *Native Title Act 1993* provides recognition and protection for native title. The Act establishes the managing body, National Native Title Tribunal, who administers native title claims to rights and interests over lands and waters by Aboriginal people. It also administers the future act processes that allow proponents to identify and manage potential native title issues for a given activity on a site where a claim has yet to be made or finalised.

In addition, the Act provides for Indigenous Land Use Agreements (ILUA), which is an agreement between a native title group and others about the use and management of land and waters. ILUAs were introduced as a result of amendments to the Act in 1998. They allow people to negotiate flexible and bipartisan agreements to suit their particular circumstances often circumventing lengthy timeframes associated with the native title process. An ILUA can be negotiated over areas where native title has, or has not yet, been determined. They can be part of a broader determination or settled separately.

A.2 State

A.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the over-arching Act that dictates the nature of assessment and management of the environment during a development project, and within which heritage forms a component. requires that environmental and heritage impacts are considered by consent authorities prior to granting development approvals.

The Act has two main approval pathways within which heritage needs to be considered. Generally, for smaller scale (either financially or spatially), Parts 4 (Division 4.1) and 5 (Division 5.1) of the Act are implemented. Part 4 requires that a proponent submits a Development Application (DA) to local council for a given development, and within this document a consideration of Aboriginal and historical heritage is required. The specific nature of the assessment is usually determined at a pre-DA meeting with the council, and in relation to the relevant heritage Acts. Where Aboriginal heritage is identified as an issue, the DA may become Integrated Development, whereby the State government is also required to review and provide comments on the DA prior to its issue. Part 5 of the Act is a similar process, but only relates to approvals developed and issued by State government departments. Each State government department has their own internal approach to considering environmental issues, but ultimately must develop a Review of Environmental Factors (REF), which is comparable to a DA, and which requires consideration and management of heritage. Similarly, where heritage is identified as an issue, liaison with relevant State consent authorities and approvals under other Acts may still be required.

The other approval pathway relates to State Significant Development and/or Infrastructure (Parts 4.7 and 5.2, respectively). These processes require an Environmental Impact Statement (EIS) to be developed for a project and assessed currently by the Department of Planning, Industry and Environment. Importantly, the SSD and SSI processes turns off a number of pieces of other legislation, including parts of the *National Parks and Wildlife Act 1974*. In the case of Aboriginal heritage, both the assessment and approval for harm are dictated by the Secretary's Environmental Assessment Requirements (SEARs) outlining the contents and scope of the EIS, and the Project Approval that dictates controls on how a development should proceed.

A.2.2 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) provides protection for Aboriginal objects and places across NSW:

- An Aboriginal object is defined as: *Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains.*
- An Aboriginal place is: *any place declared to be an Aboriginal place under Section 84.* This is a very specific piece of legislation that provides process and management of Aboriginal sites of cultural, but not necessarily scientific, values. They are commonly, but not always associated with intangible values.
- any place declared to be an Aboriginal place by the Minister for the Environment, under Section 84 of the Act.

It is an offence to disturb Aboriginal objects or places without an Aboriginal Heritage Impact Permit (AHIP), which is outlined in Section 90 of the Act. Currently, such permits can be sought from the Chief Executive of the NSW Department of Premier and Cabinet (DPC), with the recent relocation of the Office of Environment and Heritage.

To obtain an AHIP, certain assessment and documentation (outlined in this report) must be provided to DPC for their consideration. Once satisfied, they may endorse an AHIP to harm cultural heritage either conditionally or unconditionally. They can also refuse an application as outlined in Section 90C of the Act, and which can be appealed in accordance with Section 90L.

A.2.3 Aboriginal Land Rights Act 1983

The *Aboriginal Land Rights Act 1983* provides process and protocols for the transfer of vacant Crown land ownership to a Local Aboriginal Land Council, where the land is not for an essential purpose or for residential land. These lands are then managed and maintained by the Local Aboriginal Land Council.

For the purposes of this report, the Act is primarily important to inform relevant Aboriginal communities for consultation; and where Crown land forms part of the development area may require additional liaison with the LALC as a potential, or existing, landowner.

Appendix B

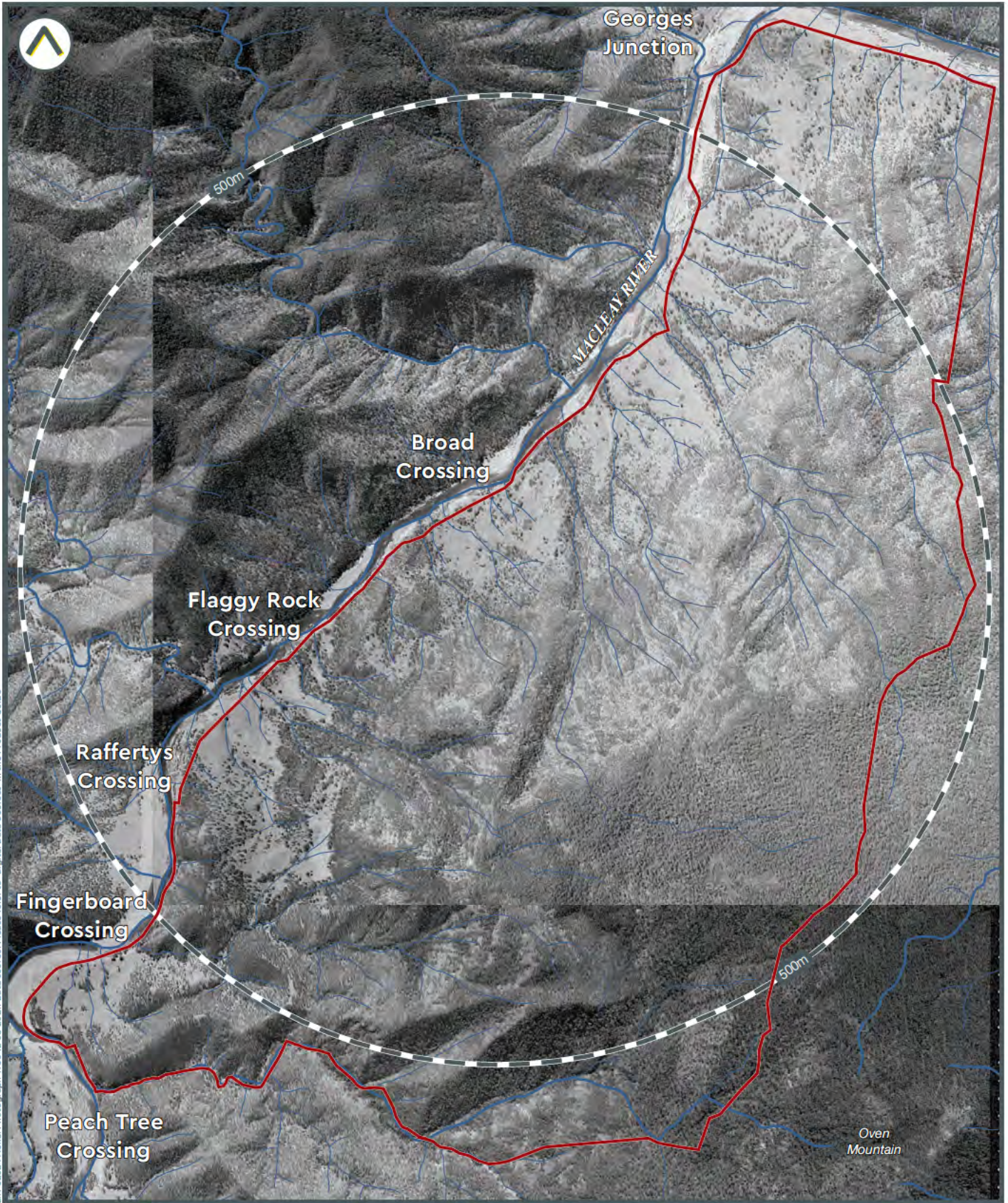
Aboriginal community consultation

Appendix redacted for public exhibition

Appendix C

Historical aerials

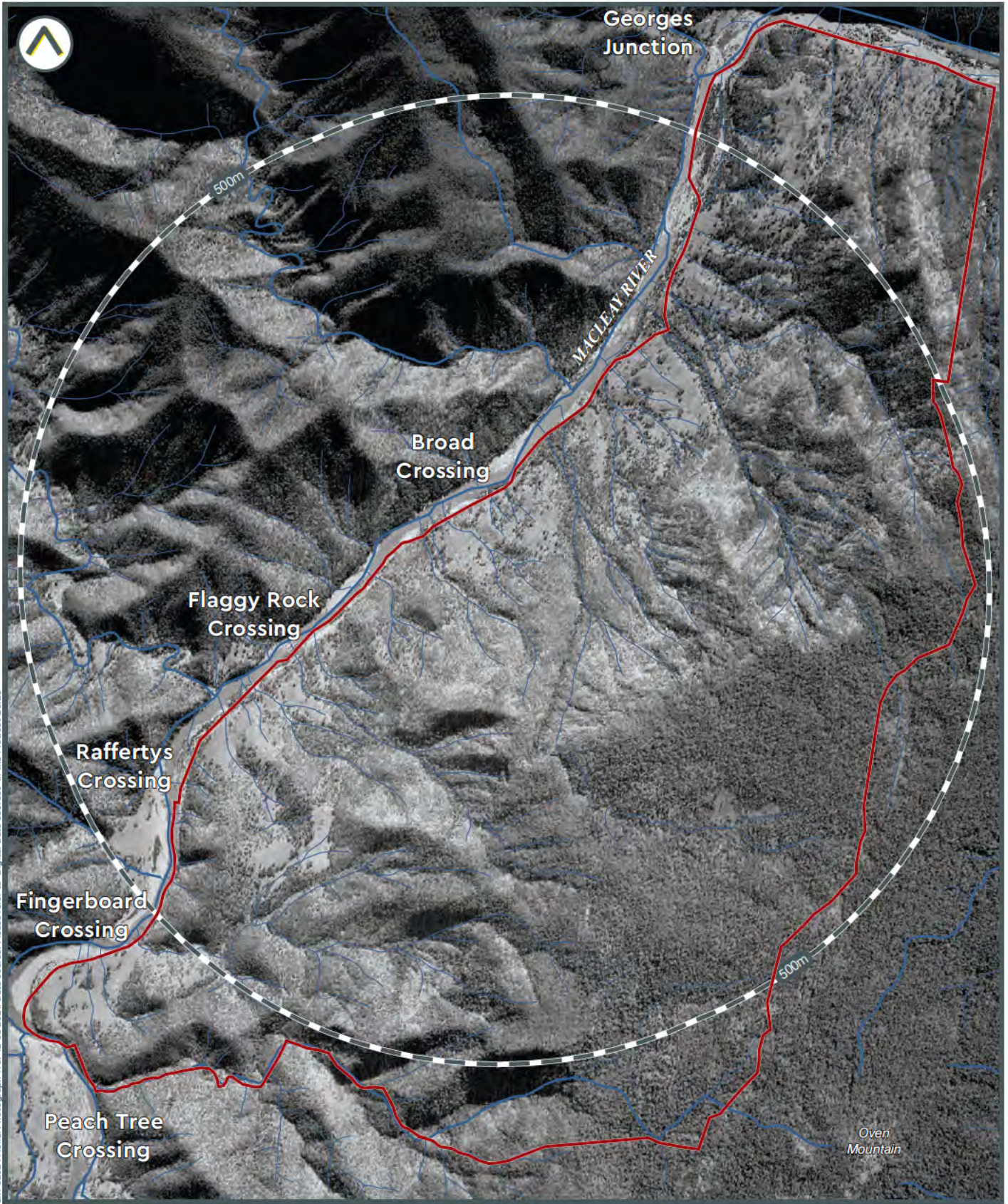
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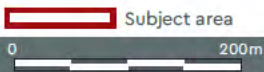
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Historic Aerial Photograph - 1967



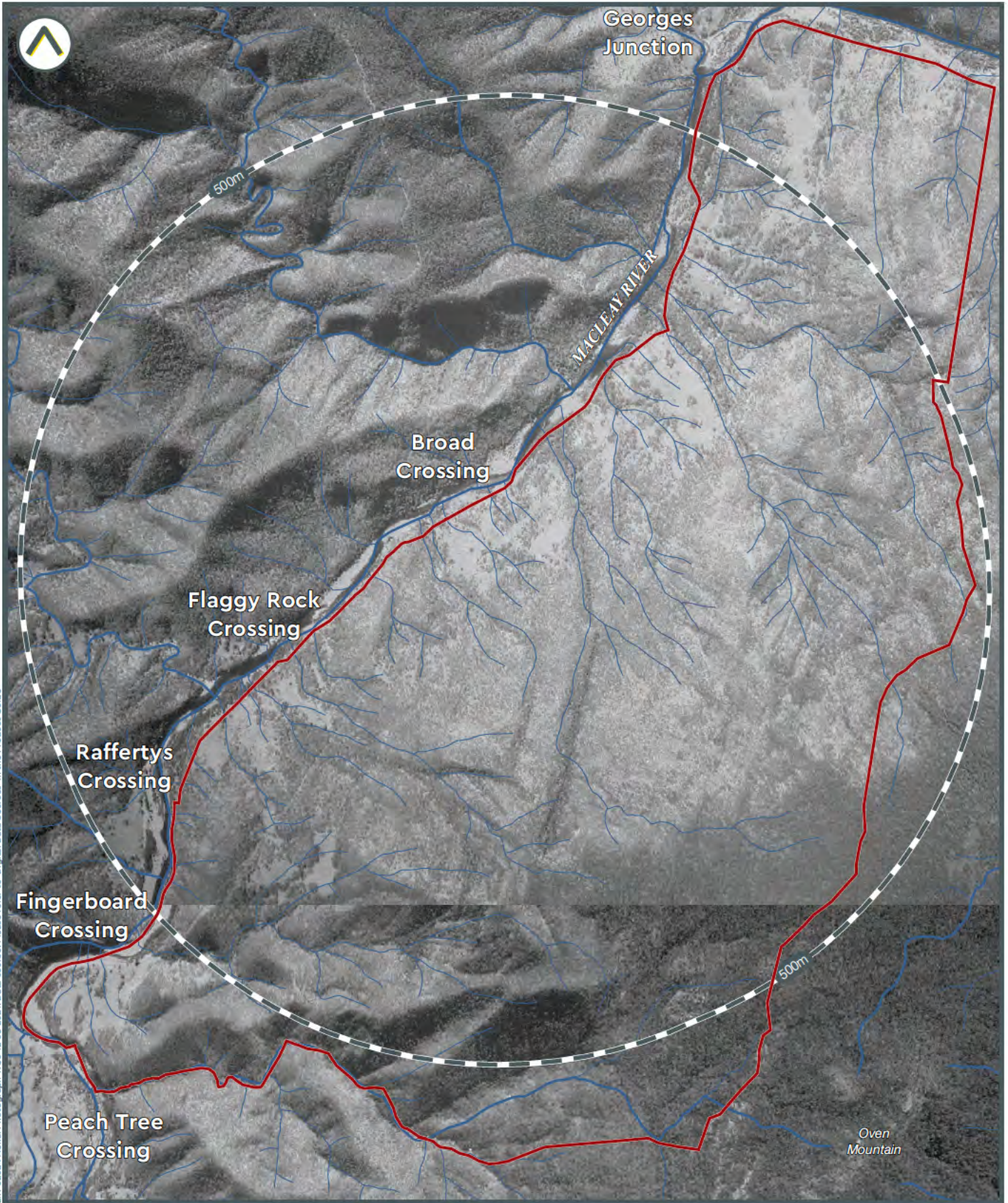
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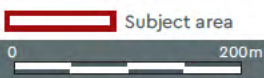
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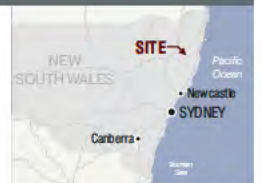
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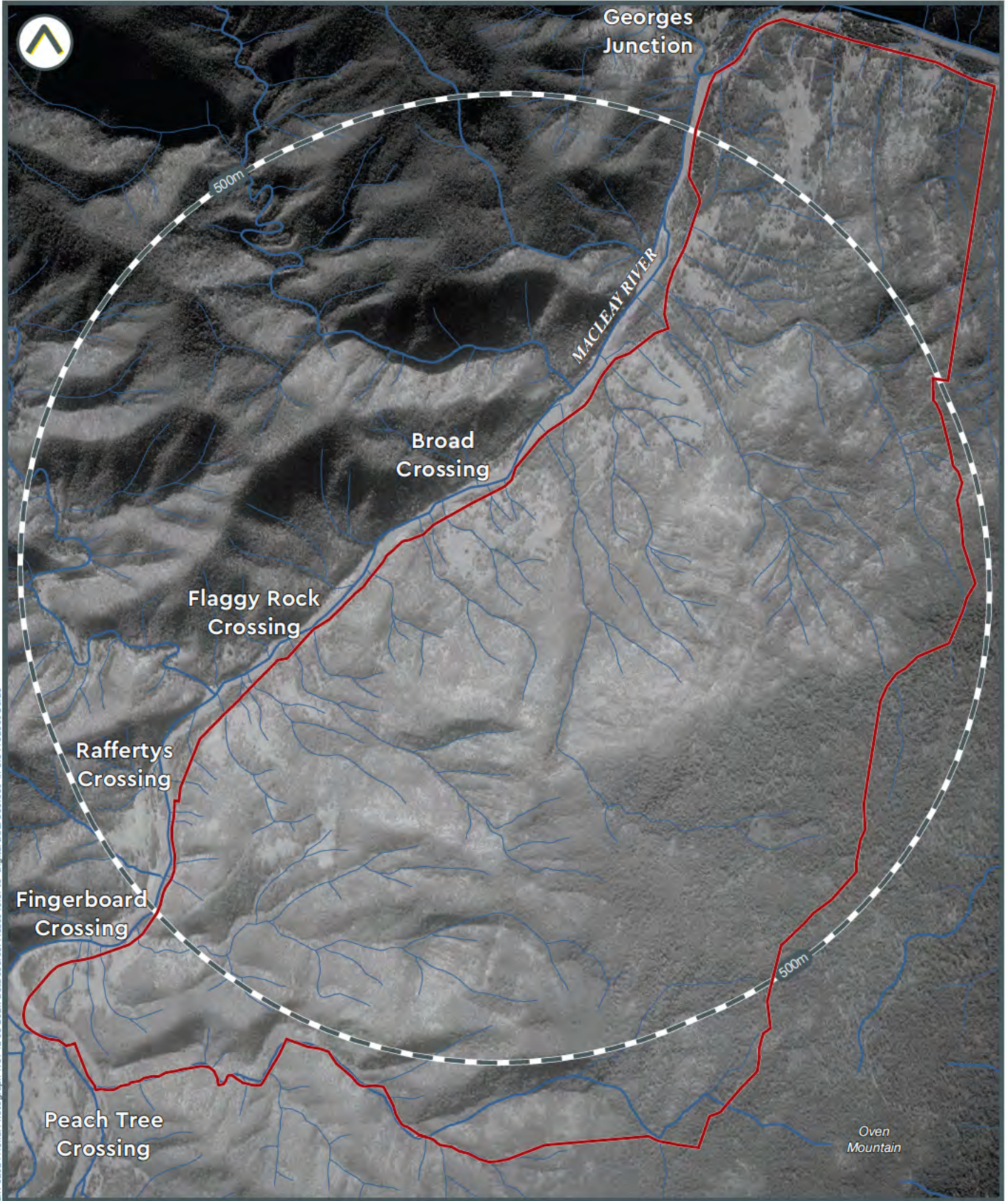
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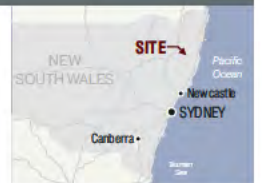
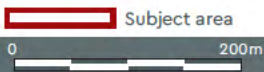
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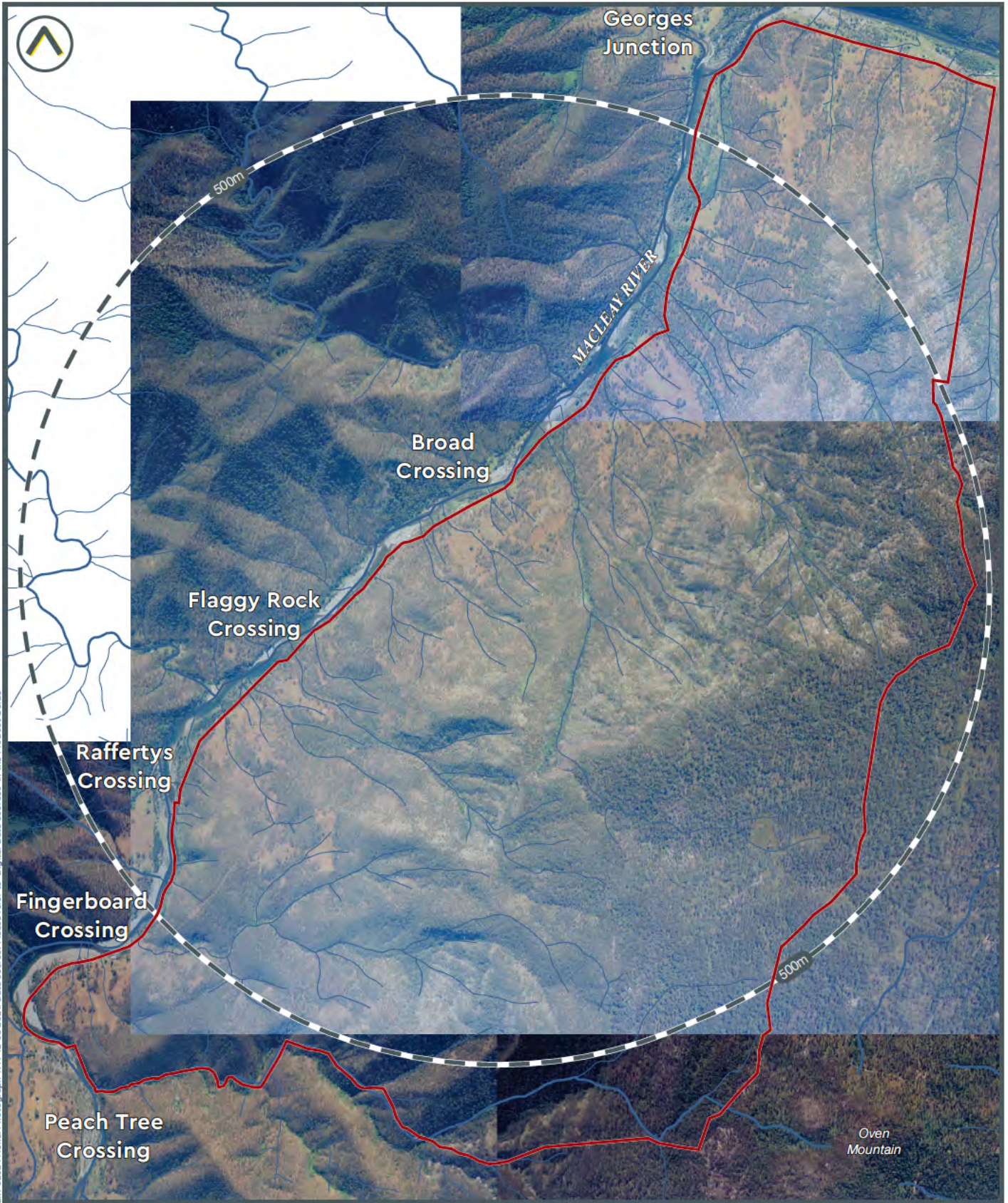
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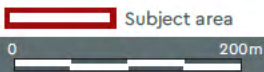
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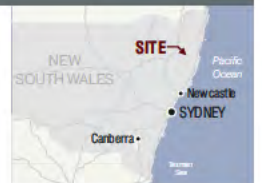
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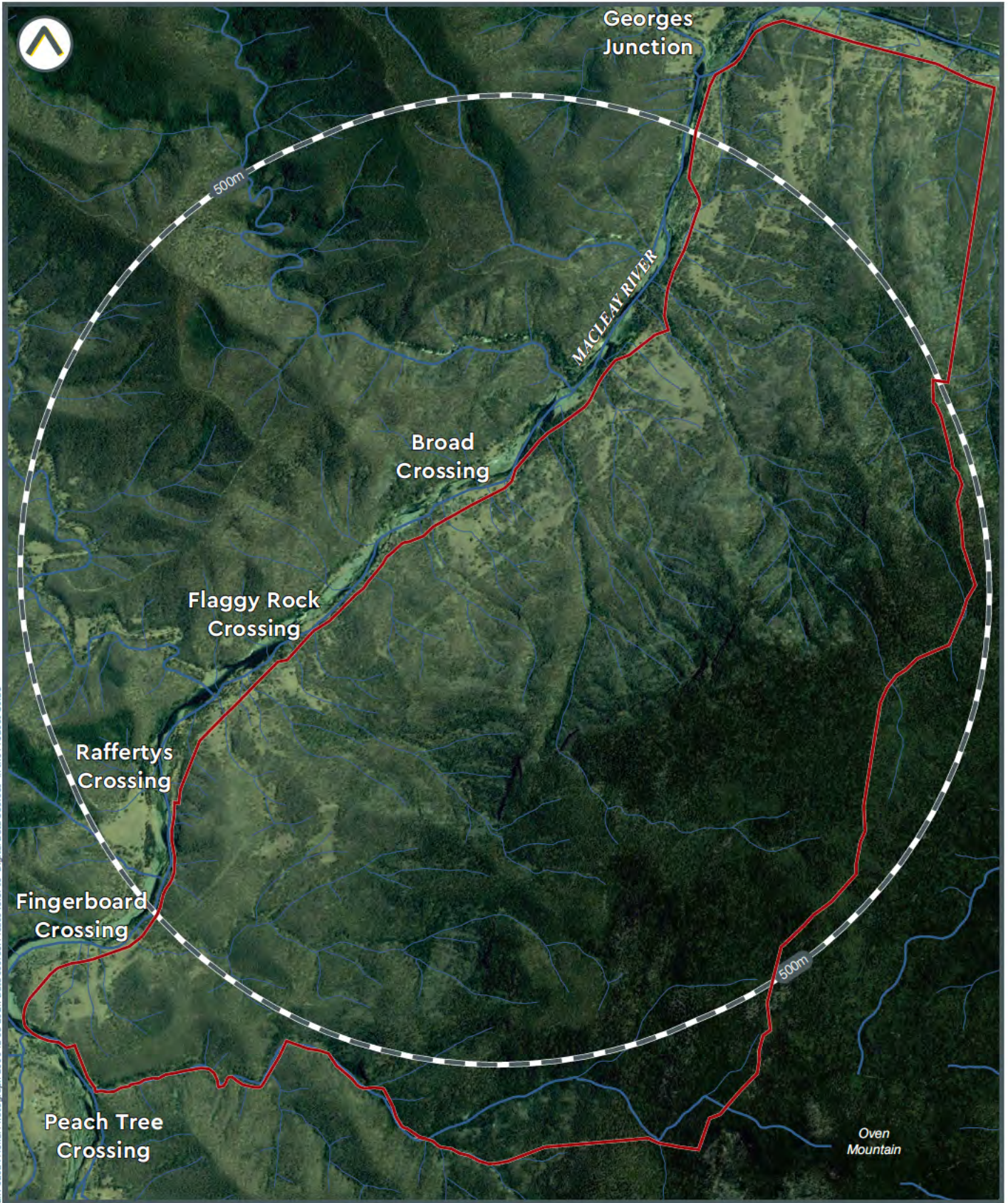
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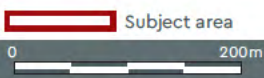
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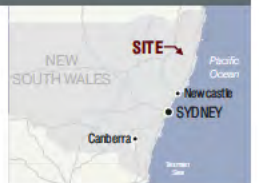
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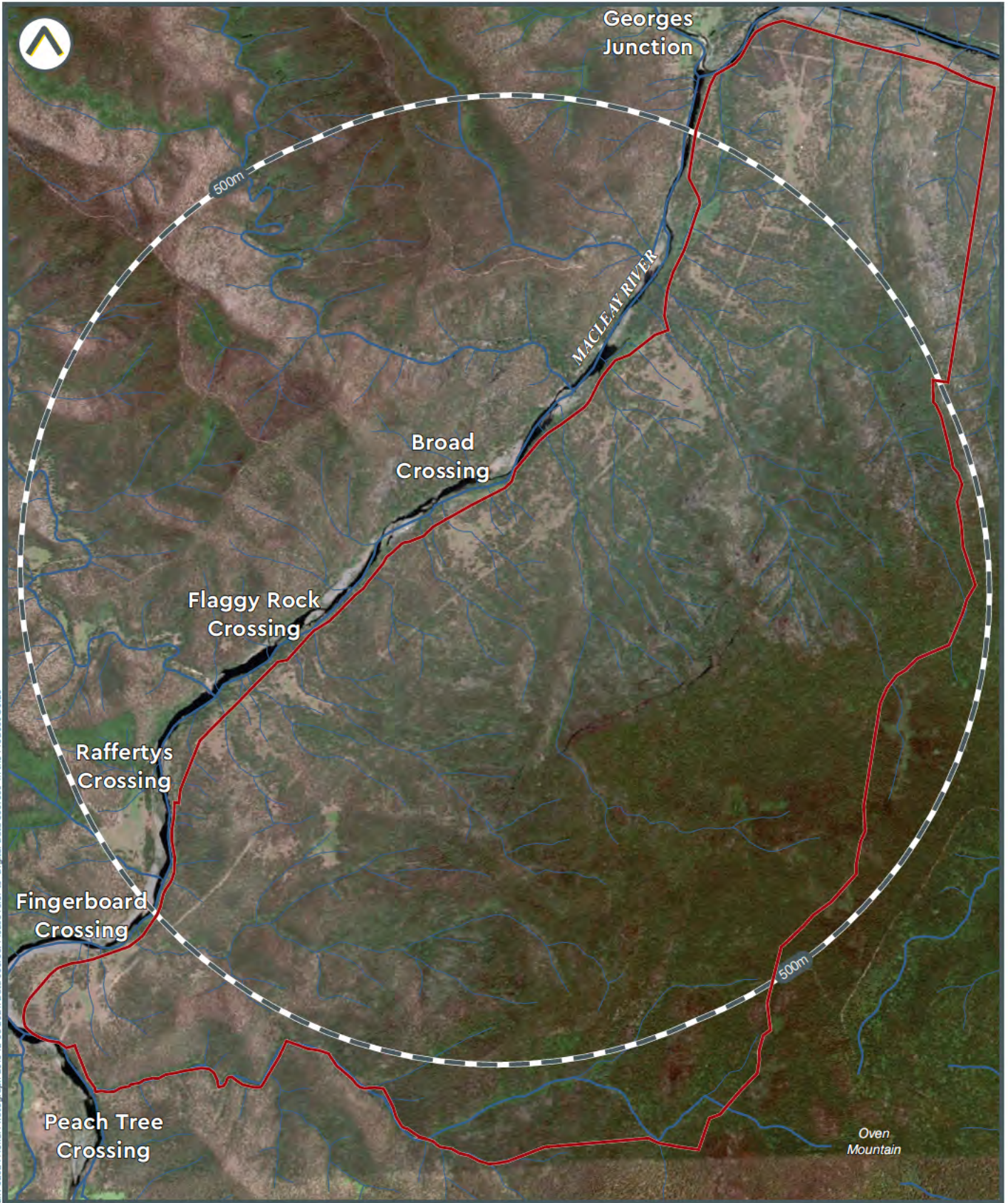
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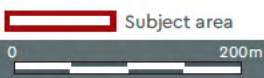
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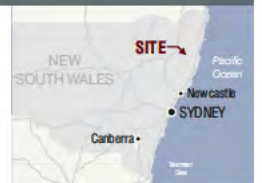
Historic Aerial Photograph - 2013



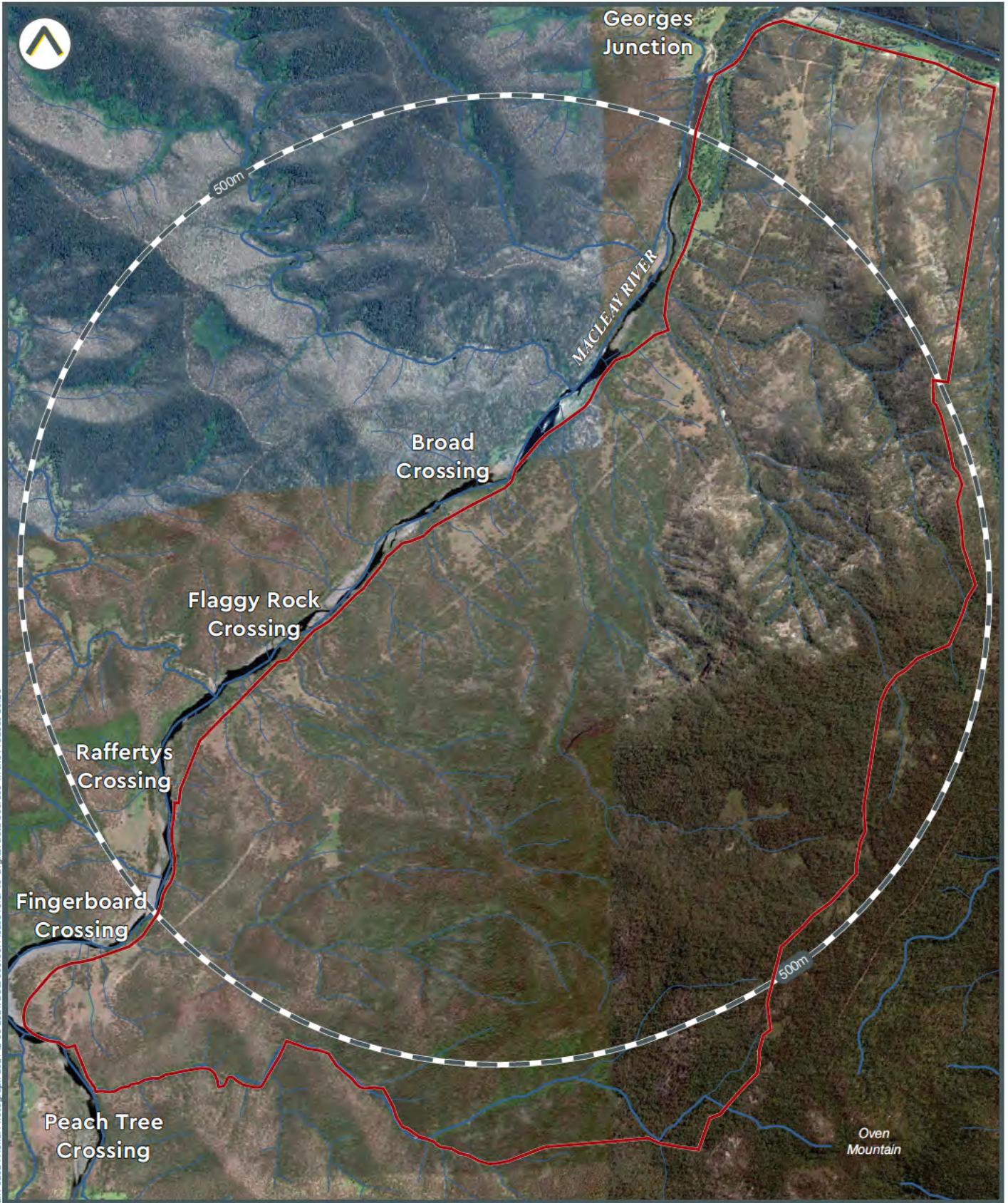
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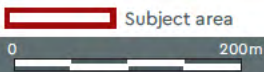
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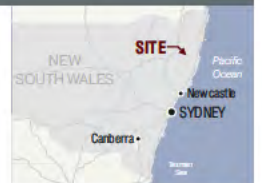
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LIR-02024, Aerial Photograph 2021 12 08 2021, Data source: Please refer to 'Digital Data Sources' in the Product Guide



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Appendix D

Cultural mapping report

Appendix E

Archaeological background

E.1 Site definitions and recording methods used for this assessment

E.1.1 Aboriginal sites

In the AHIMS database, Aboriginal sites are defined in several ways. At the simplest level, sites are recorded as 'closed' or 'open'. Closed sites are associated with rockshelters and include other evidence of Aboriginal occupation that may be present, such as areas where subsurface Aboriginal objects may occur within the shelter ('potential archaeological deposit' (PAD)), faunal remains, and art on the shelter walls (paintings/engravings). Open sites are broadly defined and encompass all other types of Aboriginal site features that are located in areas where there is no rockshelter. The most common open site features found generally include artefacts, grinding grooves, art, culturally modified trees, and shell deposits (middens) (OEH 2012). The presence or absence of stone artefacts is often a defining factor in site identification, with almost every site likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of past Aboriginal visitation.

Any one site (or group of linked sites described as a 'complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different site features known to occur in the vicinity of the project area is provided in Table E.1 and use definitions provided by OEH and those adopted by EMM in their field investigations to produce consistency in recording. Similarly, there may be places of contemporary significance to Aboriginal people in the region and that will require consultation with this community to identify.

Table E.1 Site definitions and recording

Site feature	Definition and recording methods
Aboriginal ceremony and Dreaming	Previously referred to as mythological sites these are spiritual/story places where no physical evidence of previous use of the place may occur; e.g. natural unmodified landscape features, ceremonial or spiritual areas, men's/women's sites, dreaming (creation) tracks, marriage places etc.
Artefact site (open stone artefact site)	Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people. Open stone artefact sites were defined by the presence of one (isolated find) or more (artefact scatter) stone artefacts visible on the ground surface. The boundaries of a site are limited to the spatial extent of the visible stone artefacts. The mapped site points and/or 'site areas' do not represent the areas of potential archaeological deposit (PAD) that also apply to some sites (refer to the term 'PAD' below). Open stone artefact sites were recorded by marking each artefact location or each cluster of artefacts within a 5 m radius as a separate waypoint in the GPS. Site boundaries were allocated by drawing a line around the cluster waypoints for each site using ArcGIS software. Stone artefacts more than 50 m apart were recorded as separate sites. EMM acknowledges that the 50 m rule applied here is an arbitrary distinction for site boundaries and is used mainly for efficiencies in site management and to establish consistency in site recording methods
Burials	A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked; e.g. in caves, marked by stone cairns, in sand areas, along creek banks etc.
Fish trap	A modified area on watercourses where fish were trapped for short-term storage and gathering.
Grinding grooves	Grinding grooves were defined as an area of outcropping bedrock containing evidence of one or more grinding grooves where ground-stone hatchets or other grinding practices (i.e. seed grinding) were implemented.

Table E.1 Site definitions and recording

Site feature	Definition and recording methods
Habitation structure	<p>Structures constructed by Aboriginal people for short- or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds etc.</p>
Modified tree (carved or scarred)	<p>Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc., or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.</p> <p>Modified trees (either carved or scarred) can be difficult to identify. Scars commonly occur on trees through natural processes such a branch tears, insect damage, storm and fire damage and faunal damage. Scars can also occur from mechanical damage from vehicles or farming equipment.</p> <p>The attributes of potential scarred trees were discussed during the survey amongst archaeologists and RAPs before it was decided if a scar would be recorded or not. A precautionary approach was adopted, whereby some of the more ambiguous examples were recorded anyway. The assessment of scar trees was made from the experience of the survey team and the guideline <i>Aboriginal scarred trees in New South Wales: a field manual</i> (DEC 2005). In some of the more ambiguous examples, it cannot be verified whether some scars recorded during the survey are of natural or Aboriginal origin. In such instances, an expert evaluation by a scar tree expert (arborist or other) would be required to determine the status of certain trees.</p>
Potential archaeological deposit (PAD)	<p>An area where Aboriginal objects may occur below the ground surface.</p> <p>The term ‘potential archaeological deposit’ was first applied in Sydney regional archaeology in the 1980s and referred to rockshelters that were large enough and contained enough accumulated deposit to allow archaeologists to predict that subsurface cultural material was likely to be present. Since then the term has come to include open sites where the same prediction can be made.</p> <p>EMM has defined PADs as the predicted extent of concentrated subsurface Aboriginal objects in a particular area. PADs are not technically Aboriginal sites until, and if, subsurface Aboriginal objects are identified, which is typically established through archaeological test excavation. PAD areas have been assigned to landforms that are distinguishable from the surrounding landscape (e.g. elevated areas with good outlook overlooking watercourses) as being likely to retain higher artefact densities than the assumed ‘background scatter’ of archaeological material in the broader landscape.</p> <p>The identification of PADs associated with Aboriginal open camp sites was partly based on observations in the field and discussions with RAPs, but also related to the predictive model. Although PAD was attributed to areas for a variety of reasons, the main qualifiers were:</p> <ul style="list-style-type: none"> • The presence of surface artefacts or other Aboriginal objects. Ground surface visibility as part of the archaeological survey effort was typically considered high enough in each PAD area to identify at least one or more surface artefacts thereby indicating likelihood of subsurface potential. Notwithstanding, finding no visible surface artefacts in an area would not disqualify an area from being attributed with PAD. • Level to gently inclined ground (<10%) indicating suitable camping or activity areas. • Contours that distinguish the landforms with PAD from the surrounding landscape (e.g. spur crest, hill crest or knoll). Landform boundaries were also interpreted through observations in the field. Notably, rocky crest landforms that were protected from intensive cultivation were often attributed with PAD. • Proximity to water: typically up to 100 m from 1st and 2nd order streams and up to 200 m from 3rd order streams and above. Elevated landforms at the confluence of higher order streams were also more likely to be attributed with PAD. <p>EMM acknowledges that all PAD areas have been historically cleared of native vegetation and some have been subject to pasture improvements such as ploughing. As such, the term PAD does not assume high subsurface integrity; instead it is a prediction of potential subsurface artefact concentrations.</p> <p>All stone quarry sites are predicted to have PAD. The assumption is that in most cases the visible surface material at quarries is represented by larger artefacts (such as cores) and that smaller material (e.g. flakes) is likely to be buried.</p>

Table E.1 Site definitions and recording

Site feature	Definition and recording methods
Restricted	Site information contained in the Aboriginal Heritage Information Management System is available only to certain authorised groups of people, as requested by the Aboriginal community. Detailed information may not be available in search reports.
Shell	An accumulation or deposit of shellfish from beach, estuarine, lacustrine or riverine species resulting from Aboriginal gathering or consumption. Usually found in deposits previously referred to as shell middens. Must be found in association with other objects like stone tools, fish bones, charcoal, fireplaces/hearths, and burials. Will vary greatly in size and composition.
Stone quarry	<p>Usually a source of good quality stone which is quarried and used for the production of stone tools.</p> <p>Stone quarries represent where Aboriginal people gathered raw stone materials for stone tools and/or manufactured stone tools from the adjacent source material. Quarry sites are found at rock outcrops where the material was of suitable quality to have been used to manufacture stone tools. Stone quarries were defined by the presence of outcropping stone material with nearby evidence of the same material type used in the stone tool manufacture process. This was most commonly indicated by large stone cores or stone flakes distributed amongst the same naturally outcropping material.</p> <p>EMM acknowledges that the 'open stone artefact' site type shares some of the same characteristics as 'stone quarries', such as the presence of stone artefacts. However, they have been distinguished from each other because quarries can not only represent open camping activities, but also a fixed location where Aboriginal people needed to visit to extract a resource. In contrast, the locations of typical open camp sites were not fixed but chosen by Aboriginal people for their favourable conditions.</p>

E.2 AHIMS search results

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0009	Peedee Station	AGD	56	448500	6592300	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	485,1626,1034 33
	<u>Contact</u>									
21-5-0068	Sheep Station Bluff Massacre	AGD	56	450000	6593000	Open site	Valid	Conflict : -	Massacre	
	<u>Contact</u>									
21-5-0086	Crown Road # 1	AGD	56	411700	6601710	Open site	Valid	Artefact : 1		
	<u>Contact</u> S Scanlon									
21-5-0129	KE-C-5 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	<u>Contact</u>									
21-5-0071	KE-C-1 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	<u>Contact</u>									
21-5-0143	George's junction scarred tree	GDA	56	422881	6597396	Open site	Valid	Aboriginal Resource and Gathering : -, Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>									
21-5-0027	Ngah-goy Increase Site	AGD	56	447350	6593600	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1180,1626
	<u>Contact</u>									
21-5-0062	Gomera Creek 2;Nulla Five Day SF;	AGD	56	447480	6604500	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>									
21-5-0111	halls peck	GDA	56	404677	6598893	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>									
21-5-0137	Restriction applied. Please contact [REDACTED] (Abo)					Open site	Valid			
	<u>Contact</u>									
21-5-0065	Kunderang West Station Massacre	AGD	56	412030	6587200	Open site	Valid	Conflict : -	Massacre	
	<u>Contact</u>									
21-5-0153	Ring of Rocks Stone Arrangement	GDA	56	414386	6577802	Open site	Valid	Stone Arrangement : -		
	<u>Contact</u>									
21-5-0113	East Kunderang Homestead Water Pipeline Artefact 1	AGD	56	418175	6590250	Open site	Valid	Artefact : 3		
	<u>Contact</u>									

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0008	Five Day Creek;Mt Woorong Woorong; Contact	AGD	56	442700	6601400	Open site	Valid	Burial : -	Burial/s	1626,1746
21-5-0061	Pee Dee West 5;Nulla Five Day SF; Contact	AGD	56	444880	6601630	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0139	Left Hand Hut Contact	GDA	56	421623	6579721	Open site	Valid	Artefact : 1		
21-5-0056	Gomera Creek;Nulla Five Day State Forest; Contact	AGD	56	447170	6603800	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0028	Peedee Contact	AGD	56	448100	6592300	Open site	Not a Site	Artefact : -	664 Not an Aboriginal Site	
21-5-0043	KW_1; Contact	AGD	56	410800	6586500	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0045	KW_3;Kunderang West; Contact	AGD	56	412500	6586300	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0066	KE-BS-1 Contact	AGD	56	418000	6590400	Open site	Valid	Burial : -	Burial/s	
21-5-0041	Kunderang East site Contact	AGD	56	418200	6590300	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0115	East Kunderang Homestead Water Pipeline Artefact 3 Contact	AGD	56	418205	6589951	Open site	Valid	Artefact : 2		
21-5-0059	Pee Dee West 3;Nulla Five Day SF; Contact	AGD	56	445100	6602100	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0057	Pee Dee West 1 Contact	AGD	56	445600	6602440	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0001	McCormack's Flat Little Smith Creek Contact	AGD	56	431000	6598500	Open site	Valid	Burial : -	Burial/s	1746
21-5-0067	Towal Creek Massacre Contact	AGD	56	433400	6588800	Open site	Valid	Conflict : -	Massacre	
21-5-0063	Gomera Creek 3; Contact	AGD	56	447080	6604740	Open site	Valid	Artefact : -	Open Camp Site	2598
21-5-0136	Restriction applied. Please contact Contact					Open site	Valid			
12-5-0003	Crayfish Creek Henry River Contact	AGD	56	412010	6601810	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0134	Restriction applied. Please contact [REDACTED]					Open site	Valid			
	Contact	Recorders	Mr.Russell Reid					Permits		
21-5-0116	East Kunderang Homestead Water Pipeline Artefact 4	AGD	56	418191	6589955	Open site	Valid	Artefact : 2		
	Contact	Recorders	Mr.Bruce Cohen					Permits		
21-5-0003	Oven Mountain;	AGD	56	423000	6590000	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	
	Contact	Recorders	Ray Kelly,Mr.Richard Kelly					Permits		
21-5-0072	Carrai Engravings	AGD	56	429446	6586082	Open site	Valid	Art (Pigment or Engraved) : 5		
	Contact	Recorders	Mr.John Willoughby					Permits		
21-5-0138	Carrai Ceremonial Location	GDA	56	430448	6585327	Open site	Valid	Aboriginal Resource and Gathering : 1, Aboriginal Ceremony and Dreaming : 1, Ceremonial Ring (Stone or Earth) : 1		
	Contact	Recorders	Doctor.Graham KNUCKEY,Remnant Archaeology					Permits		
21-5-0112	halls peck 2	GDA	56	405926	6598562	Closed site	Valid	Ochre Quarry : -		
	Contact	Recorders	Mr.Bruce Cohen					Permits		
21-5-0050	Apsley-Macleay Junction Oxley- Wild Rivers National Park	AGD	56	410000	6585300	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Mr.Luke Godwin					Permits		
21-5-0042	Kunderang West;	AGD	56	411800	6587400	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Mr.Luke Godwin					Permits		
21-5-0064	Massacre at the junction of Durallie Creek and Kunderang Brook	AGD	56	413000	6588000	Open site	Valid	Conflict : -	Massacre	
	Contact	Recorders	ASRSYS					Permits		
21-5-0130	KE-C-6 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	Contact	Recorders	Jim Kelton					Permits		
21-5-0120	East Kunderang Water pipeline Artefact 5	AGD	56	418200	6589933	Open site	Valid	Artefact : 2		
	Contact	Recorders	Mr.Bruce Cohen					Permits		
21-5-0114	East Kunderang Homestead Water Pipeline Artefact 2	AGD	56	418212	6589999	Open site	Valid	Artefact : 2		
	Contact	Recorders	Mr.Bruce Cohen					Permits		
21-5-0032	Pee Dee Massacre Site	AGD	56	447200	6591500	Open site	Valid	Conflict : -	Massacre	
	Contact	Recorders	Ray Kelly,Donald Thompson					Permits		
21-5-0083	Oakey Fire Trail a	AGD	56	410860	6602120	Open site	Valid	Art (Pigment or Engraved) : 1		3090
	Contact	Recorders	Davies Heritage Consultants Pty Ltd					Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0085	Duvals Fire Trail Contact	AGD	56	410960	6597920	Open site	Valid	Artefact : 1		3090
21-5-0084	Oakey Fire Trail b Contact	AGD	56	411090	6601790	Open site	Valid	Artefact : 1		3090
21-5-0087	Crown Road # 2 Contact Searle	AGD	56	411775	6601780	Open site	Valid	Artefact : 1		
21-5-0082	Haydons Fire Trail Contact	AGD	56	416130	6598120	Open site	Valid	Artefact : 1		3090
21-5-0127	KE-C-3 (Carrai) Contact	AGD	56	417950	6590100	Open site	Valid	Habitation Structure :-		
21-5-0121	Restriction applied. Please contact ahims@environment.nsw.gov.au. Contact					Open site	Valid			
21-5-0119	East Kunderang Watertank Artefact 1 Contact	AGD	56	418175	6589960	Open site	Valid	Artefact : 5		
21-5-0046	Kunderang Bk 1;East Kunderang; Contact	AGD	56	419100	6583900	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0025	Towel Creek Station; Contact	AGD	56	440400	6591200	Open site	Valid	Aboriginal Ceremony and Dreaming : -		1180,1626
21-5-0058	Pee Dee West 2;Nulla Five Day SF; Contact	AGD	56	445310	6602370	Open site	Valid	Artefact : -	Open Camp Site	
21-5-0055	Comara Range;Nulla Five Day State Forest; Contact	AGD	56	446160	6603960	Open site	Valid	Artefact : -	Open Camp Site 664	2598
21-5-0128	KE-C-4 (Carrai) Contact	AGD	56	417950	6590100	Open site	Valid	Habitation Structure :-		
21-5-0118	East Kunderang Homestead Artefact 3 Contact	AGD	56	418071	6590281	Open site	Valid	Artefact : 2		
21-5-0117	East Kunderang Homestead Artefact 2 Contact	AGD	56	418098	6590228	Open site	Valid	Artefact : 2		
21-5-0126	KE-C-2 (Carrai) Contact	AGD	56	418290	6589990	Open site	Valid	Habitation Structure :-		
21-5-0024	Jobs Mountain; Contact	AGD	56	439700	6600700	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1626

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0023	Georges Creek;	AGD	56	422270	6596320	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1180,1493
	Contact							Permits		
21-5-0005	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			102748
	Contact							Permits		
21-5-0006	Lower Creek;	AGD	56	429400	6600400	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Ceremonial Ring (Stone or Earth) :-	Bora/Ceremonial,Natural Mythological (Ritual)	1746
	Contact							Permits		
21-5-0031	Pee Dee Bluff Massacre Site	AGD	56	448100	6593200	Open site	Valid	Conflict : -	Massacre	1626,1746
	Contact							Permits		
21-5-0011	Kunderang Station;Oven Mountain;	AGD	56	419000	6590700	Open site	Valid	Stone Arrangement : -	Stone Arrangement	
	Contact							Permits		
21-5-0026	Comara	AGD	56	440800	6593700	Open site	Valid	Burial : -	Burial/s	1180,1626
	Contact							Permits		
21-5-0060	Pee Dee West 4;Nulla Five Day SF;	AGD	56	444420	6600800	Open site	Valid	Artefact : -	Open Camp Site	
	Contact							Permits		
21-5-0054	Comara Range;	AGD	56	446160	6603960	Open site	Valid	Artefact : -	Open Camp Site	3153
	Contact							Permits	653	
21-5-0069	Eastern Boundary FT - Scarred Tree #1	AGD	56	420200	6598550	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact							Permits		
21-5-0070	Eastern Boundary FT Scarred Tree #2	AGD	56	420200	6598700	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact							Permits		
12-5-0063	Henry River Lookout rd	AGD	56	422400	6601150	Open site	Valid	Artefact : -	Open Camp Site	
	Contact							Permits		
21-5-0142	George's junction Site	GDA	56	422864	6597347	Open site	Valid	Artefact : -		
	Contact							Permits		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AH MS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0009	Peedee Station	AGD	56	448500	6592300	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	485,1626,1034 33
	Contact									
	Recorders									
21-5-0068	Sheep Station Bluff Massacre	AGD	56	450000	6593000	Open site	Valid	Conflict : -	Massacre	
	Contact									
	Recorders									
21-6-0023	Bellbrook Possum Increase Site	AGD	56	451700	6588700	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1626
	Contact									
	Recorders									
21-5-0129	KE-C-5 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	Contact									
	Recorders									
21-5-0071	KE-C-1 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	Contact									
	Recorders									
21-5-0080	Fire Trail Road	AGD	56	421680	6615520	Open site	Valid	Artefact : 1		
	Contact									
	Recorders									
21-5-0143	George's junction scarred tree	GDA	56	422881	6597396	Open site	Valid	Aboriginal Resource and Gathering : -, Modified Tree (Carved or Scarred) : -		
	Contact									
	Recorders									
21-5-0079	Eely Creek	AGD	56	425200	6614600	Open site	Valid	Artefact : 1		3090
	Contact									
	Recorders									
21-6-0151	Westend 1-1;	AGD	56	456750	6597550	Open site	Valid	Artefact : -	Open Camp Site	2598
	Contact									
	Recorders									
21-5-0027	Ngah-goy Increase Site	AGD	56	447350	6593600	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1180,1626
	Contact									
	Recorders									
21-5-0062	Gomera Creek 2;Nulla Five Day SF;	AGD	56	447480	6604500	Open site	Valid	Artefact : -	Open Camp Site	
	Contact									
	Recorders									
21-6-0168	Burrel Bulai	AGD	56	458800	6593950	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Aboriginal Place	
	Contact									
	Recorders									
21-5-0113	East Kunderang Homestead Water Pipeline Artefact 1	AGD	56	418175	6590250	Open site	Valid	Artefact : 3		
	Contact									
	Recorders									
21-5-0008	Five Day Creek;Mt Woorong Woorong;	AGD	56	442700	6601400	Open site	Valid	Burial : -	Burial/s	1626,1746

Report generated by AHIMS Web Service on 24/02/2022 for Georgia Burnett for the following area at Lat, Long From : -30.8525, 152.1227 - Lat, Long To : -30.5573, 152.6171. Number of Aboriginal sites and Aboriginal objects found is 90

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Harry Creamer,Ray Kelly,Les Smith,Mr.Richard Kelly					Permits		
21-5-0061	Pee Dee West 5;Nulla Five Day SF;	AGD	56	444880	6601630	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Kim Lomax					Permits		
21-5-0051	Petroi 3-1;	AGD	56	432670	6613170	Open site	Valid	Artefact : -	Open Camp Site	2598
	Contact	Recorders	Paul Packard					Permits		
21-5-0124	Diamond Flat; Petroi Bora Ground	AGD	56	433500	6613900	Open site	Valid	Ceremonial Ring (Stone or Earth) : 1		
	Contact	Recorders	Ms.Mary-Jean Sutton					Permits		
21-5-0140	Diamond Flat Canoe Tree	GDA	56	434594	6618947	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	NPWS - AHD Northern Zone,Mr.Scott Filmer					Permits		
21-6-0182	Isaacs Rd #2	AGD	56	457890	6595890	Open site	Valid	Artefact : 7		
	Contact	Recorders	Paul Houston					Permits		
21-5-0056	Gomera Creek;Nulla Five Day State Forest;	AGD	56	447170	6603800	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	R Hall					Permits	664	
21-5-0028	Peedee	AGD	56	448100	6592300	Open site	Not a Site	Artefact : -	Not an Aboriginal Site	
	Contact	Recorders	Harry Creamer					Permits		
21-6-0152	Cockatoo 1-1;	AGD	56	455750	6612200	Open site	Valid	Artefact : -	Isolated Find	2598
	Contact	Recorders	Paul Packard					Permits		
21-5-0066	KE-BS-1	AGD	56	418000	6590400	Open site	Valid	Burial : -	Burial/s	
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits		
21-5-0041	Kunderang East site	AGD	56	418200	6590300	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Central West Archaeological and Heritage Services Pty Ltd,Lyn Kennedy					Permits		
21-5-0115	East Kunderang Homestead Water Pipeline Artefact 3	AGD	56	418205	6589951	Open site	Valid	Artefact : 2		
	Contact	Recorders	Mr.Bruce Cohen					Permits		
21-5-0059	Pee Dee West 3;Nulla Five Day SF;	AGD	56	445100	6602100	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Kim Lomax					Permits		
21-5-0057	Pee Dee West 1	AGD	56	445600	6602440	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Kim Lomax					Permits		
21-5-0001	McCormack's Flat Little Smith Creek	AGD	56	431000	6598500	Open site	Valid	Burial : -	Burial/s	1746
	Contact	Recorders	Ray Kelly,George Mackay					Permits		
21-5-0067	Towal Creek Massacre	AGD	56	433400	6588800	Open site	Valid	Conflict : -	Massacre	
	Contact	Recorders	Ms.Adrienne Howe-Piening					Permits		
21-6-0363	Bellbrook Repat Burial	GDA	56	454240	6591673	Open site	Valid	Burial : -		
	Contact	Recorders	Mr.Emmanuel Fewquandie					Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-6-0099	Bellbrook	AGD	56	454800	6589750	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1180,1626
	Contact							Permits		
21-6-0101	Mount Anderson Stone Arrangement	AGD	56	458600	6594200	Open site	Valid	Stone Arrangement : -	Stone Arrangement	1626
	Contact							Permits		
21-6-0144	Fisher Creek Bora 2;	AGD	56	455500	6597050	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	2598
	Contact							Permits		
21-6-0025	Bellbrook Frog Gully	AGD	56	455800	6590970	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	1626
	Contact							Permits		
21-5-0063	Gomera Creek 3;	AGD	56	447080	6604740	Open site	Valid	Artefact : -	Open Camp Site	2598
	Contact							Permits		
21-5-0116	East Kunderang Homestead Water Pipeline Artefact 4	AGD	56	418191	6589955	Open site	Valid	Artefact : 2		
	Contact							Permits		
21-5-0003	Oven Mountain;	AGD	56	423000	6590000	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	
	Contact							Permits		
21-6-0086	Bellbrook Burial Site	AGD	56	453630	6591350	Open site	Valid	Burial : -	Burial/s	1626
	Contact							Permits		
21-6-0022	Bellbrook The Burning Hill	AGD	56	453700	6591500	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1626
	Contact							Permits		
21-6-0017	Dark Gully Bellbrook	AGD	56	455770	6591900	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	1626
	Contact							Permits		
21-6-0014	Mount Anderson Anderson's Sugerloaf	AGD	56	458800	6593900	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	821,1626,1034 34
	Contact							Permits		
21-5-0130	KE-C-6 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : -		
	Contact							Permits		
21-5-0120	East Kunderang Water pipeline Artefact 5	AGD	56	418200	6589933	Open site	Valid	Artefact : 2		
	Contact							Permits		
21-5-0114	East Kunderang Homestead Water Pipeline Artefact 2	AGD	56	418212	6589999	Open site	Valid	Artefact : 2		
	Contact							Permits		

Report generated by AHIMS Web Service on 24/02/2022 for Georgia Burnett for the following area at Lat, Long From : -30.8525, 152.1227 - Lat, Long To : -30.5573, 152.6171. Number of Aboriginal sites and Aboriginal objects found is 90

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-6-0202	Flanders Tree.	AGD	56	462918	6611112	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact									
	Recorders									
21-5-0073	Turkey Road	AGD	56	429400	6617280	Open site	Valid	Artefact : 1		3090
	Contact									
	Recorders									
21-5-0053	Petroi 3-3;	AGD	56	432700	6612800	Open site	Valid	Artefact : -	Isolated Find	2598
	Contact									
	Recorders									
21-5-0007	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact									
	Recorders									
21-6-0020	Bellbrook Blue Bora Ground	AGD	56	453700	6591500	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	1626
	Contact									
	Recorders									
21-6-0015	Long Gully	AGD	56	454000	6592500	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Ceremonial Ring (Stone or Earth) : -	Aboriginal Place,Bora/Ceremo nial	1626,1889
	Contact									
	Recorders									
21-6-0024	Bellbrook Nulla Nulla Creek	AGD	56	454200	6590200	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1626
	Contact									
	Recorders									
21-6-0143	Fisher Creek Bora 1;	AGD	56	456100	6597350	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	2598
	Contact									
	Recorders									
21-5-0032	Pee Dee Massacre Site	AGD	56	447200	6591500	Open site	Valid	Conflict : -	Massacre	
	Contact									
	Recorders									
21-5-0010	Red Ochre Site;Oreen Brook;	AGD	56	450300	6586800	Open site	Valid	Stone Quarry : -, Artefact : -	Quarry	1449
	Contact									
	Recorders									
21-5-0082	Haydons Fire Trail	AGD	56	416130	6598120	Open site	Valid	Artefact : 1		3090
	Contact									
	Recorders									
21-5-0127	KE-C-3 (Carrai)	AGD	56	417950	6590100	Open site	Valid	Habitation Structure :-		
	Contact									
	Recorders									
21-5-0121	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact									
	Recorders									
21-5-0119	East Kunderang Watertank Artefact 1	AGD	56	418175	6589960	Open site	Valid	Artefact : 5		
	Contact									
	Recorders									

Report generated by AHIMS Web Service on 24/02/2022 for Georgia Burnett for the following area at Lat, Long From : -30.8525, 152.1227 - Lat, Long To : -30.5573, 152.6171. Number of Aboriginal sites and Aboriginal objects found is 90

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0025	Towel Creek Station; Contact	AGD	56	440400	6591200	Open site	Valid	Aboriginal Ceremony and Dreaming : - Permits		1180,1626
21-5-0058	Pee Dee West 2;Nulla Five Day SF; Contact	AGD	56	445310	6602370	Open site	Valid	Artefact : - Permits	Open Camp Site	
21-5-0055	Comara Range;Nulla Five Day State Forest; Contact	AGD	56	446160	6603960	Open site	Valid	Artefact : - Permits	Open Camp Site 664	2598
21-6-0276	Kosikai - Scarred Tree Contact T Russell	AGD	56	462756	6610950	Open site	Valid	Modified Tree (Carved or Scarred) : - Permits		
21-5-0052	Petroi 3-2; Contact	AGD	56	432800	6613150	Open site	Valid	Artefact : - Permits	Isolated Find	2598
21-6-0021	Bellbrook Mission Cemetery Contact	AGD	56	454300	6591800	Open site	Valid	Burial : - Permits	Burial/s	1626,98659
30-6-0132	Old Issacs TRI # 1 Contact	AGD	56	456800	6596500	Open site	Valid	Artefact : - Permits	Isolated Find	
21-6-0153	Blue Knob 1-1 Contact	AGD	56	457020	6602400	Open site	Valid	Artefact : - Permits	Open Camp Site	
21-5-0029	Oreen Brook; Contact	AGD	56	450550	6590250	Open site	Valid	Aboriginal Ceremony and Dreaming : - Permits	Natural Mythological (Ritual)	1180,1626
21-5-0030	Oreen Brook; Contact	AGD	56	451180	6591960	Open site	Valid	Aboriginal Ceremony and Dreaming : - Permits	Natural Mythological (Ritual)	1180,1626
21-5-0128	KE-C-4 (Carrai) Contact	AGD	56	417950	6590100	Open site	Valid	Habitation Structure : - Permits		
21-5-0118	East Kunderang Homestead Artefact 3 Contact	AGD	56	418071	6590281	Open site	Valid	Artefact : 2 Permits		
21-5-0117	East Kunderang Homestead Artefact 2 Contact	AGD	56	418098	6590228	Open site	Valid	Artefact : 2 Permits		
21-5-0126	KE-C-2 (Carrai) Contact	AGD	56	418290	6589990	Open site	Valid	Habitation Structure : - Permits		
21-5-0024	Jobs Mountain; Contact	AGD	56	439700	6600700	Open site	Valid	Aboriginal Ceremony and Dreaming : - Permits	Natural Mythological (Ritual)	1626

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
21-5-0002	Styx River Bora Ground;Avalon;	AGD	56	419700	6614500	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	1746
	<u>Contact</u>	<u>Recorders</u>	Harry Creamer					<u>Permits</u>		
21-5-0023	Georges Creek;	AGD	56	422270	6596320	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1180,1493
	<u>Contact</u>	<u>Recorders</u>	Ray Kelly,Mr.Richard Kelly					<u>Permits</u>		
21-5-0005	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			102748
	<u>Contact</u>	<u>Recorders</u>	Unknown Author					<u>Permits</u>		
21-5-0006	Lower Creek;	AGD	56	429400	6600400	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial,N atural Mythological (Ritual)	1746
	<u>Contact</u>	<u>Recorders</u>	Ray Kelly,Mr.Richard Kelly					<u>Permits</u>		
21-6-0019	Grunda Initiation Ground, Long Gully, Bellbrook	AGD	56	453600	6592200	Open site	Valid	Ceremonial Ring (Stone or Earth) : -	Bora/Ceremonial	1626
	<u>Contact</u>	<u>Recorders</u>	Ray Kelly,Mr.Richard Kelly					<u>Permits</u>		
21-6-0150	Hickeys 4-1;	AGD	56	458370	6597300	Open site	Valid	Artefact : -	Open Camp Site	2598
	<u>Contact</u>	<u>Recorders</u>	Paul Packard					<u>Permits</u>		
21-5-0031	Pee Dee Bluff Massacre Site	AGD	56	448100	6593200	Open site	Valid	Conflict : -	Massacre	1626,1746
	<u>Contact</u>	<u>Recorders</u>	Ray Kelly,Jim Loose,Mr.Richard Kelly					<u>Permits</u>		
21-5-0011	Kunderang Station;Oven Mountain;	AGD	56	419000	6590700	Open site	Valid	Stone Arrangement : -	Stone Arrangement	
	<u>Contact</u>	<u>Recorders</u>	Glen Morris					<u>Permits</u>		
21-5-0026	Comara	AGD	56	440800	6593700	Open site	Valid	Burial : -	Burial/s	1180,1626
	<u>Contact</u>	<u>Recorders</u>	NPWS - Blackheath Office					<u>Permits</u>		
21-5-0060	Pee Dee West 4;Nulla Five Day SF;	AGD	56	444420	6600800	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>	<u>Recorders</u>	Kim Lomax					<u>Permits</u>		
21-5-0054	Comara Range;	AGD	56	446160	6603960	Open site	Valid	Artefact : -	Open Camp Site	3153
	<u>Contact</u>	<u>Recorders</u>	R Hall					<u>Permits</u>	653	
21-5-0069	Eastern Boundary FT - Scarred Tree #1	AGD	56	420200	6598550	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>	<u>Recorders</u>	Ray Fife					<u>Permits</u>		
21-5-0070	Eastern Boundary FT Scarred Tree #2	AGD	56	420200	6598700	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>	<u>Recorders</u>	Ray Fife					<u>Permits</u>		

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
12-5-0063	Henry River Lookout rd	AGD	56	422400	6601150	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>	<u>Recorders</u>								
			Ray Fife							
21-5-0142	George's junction Site	GDA	56	422864	6597347	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>								
			Mr.Steven Ahoy							
21-6-0098	Bellbrook Mythical Eel and Porcupine	AGD	56	454700	6590390	Open site	Valid	Aboriginal Ceremony and Dreaming : -	Natural Mythological (Ritual)	1626
	<u>Contact</u>	<u>Recorders</u>								
			Harry Creamer							
21-6-0013	Bellbrook Dark Gully Burial Site	AGD	56	454800	6590700	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Burial : -	Burial/s,Natural Mythological (Ritual)	485,1626,1746, 103435
	<u>Contact</u>	<u>Recorders</u>								
			Ray Kelly,NPWS - Blackheath Office,Unknown Author,R.A Buchan,Mr.Richard Kelly							

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AH MS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 24/02/2022 for Georgia Burnett for the following area at Lat, Long From : -30.8525, 152.1227 - Lat, Long To : -30.5573, 152.6171. Number of Aboriginal sites and Aboriginal objects found is 90

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Georgia Burnett

From: Eva Day <Eva.Day@environment.nsw.gov.au> on behalf of CCHD Information Systems & Assessment Mailbox <ahims@environment.nsw.gov.au>
Sent: Wednesday, 4 August 2021 12:22 PM
To: Taylar Reid
Subject: RE: Restricted Sites and Payment

CAUTION: This email originated outside of the Organisation.

Hi Taylar,

I have updated your payment. You will not receive invoice on this.

Please see below screen shot for the below site cards showing the approximately where are site cards plotted

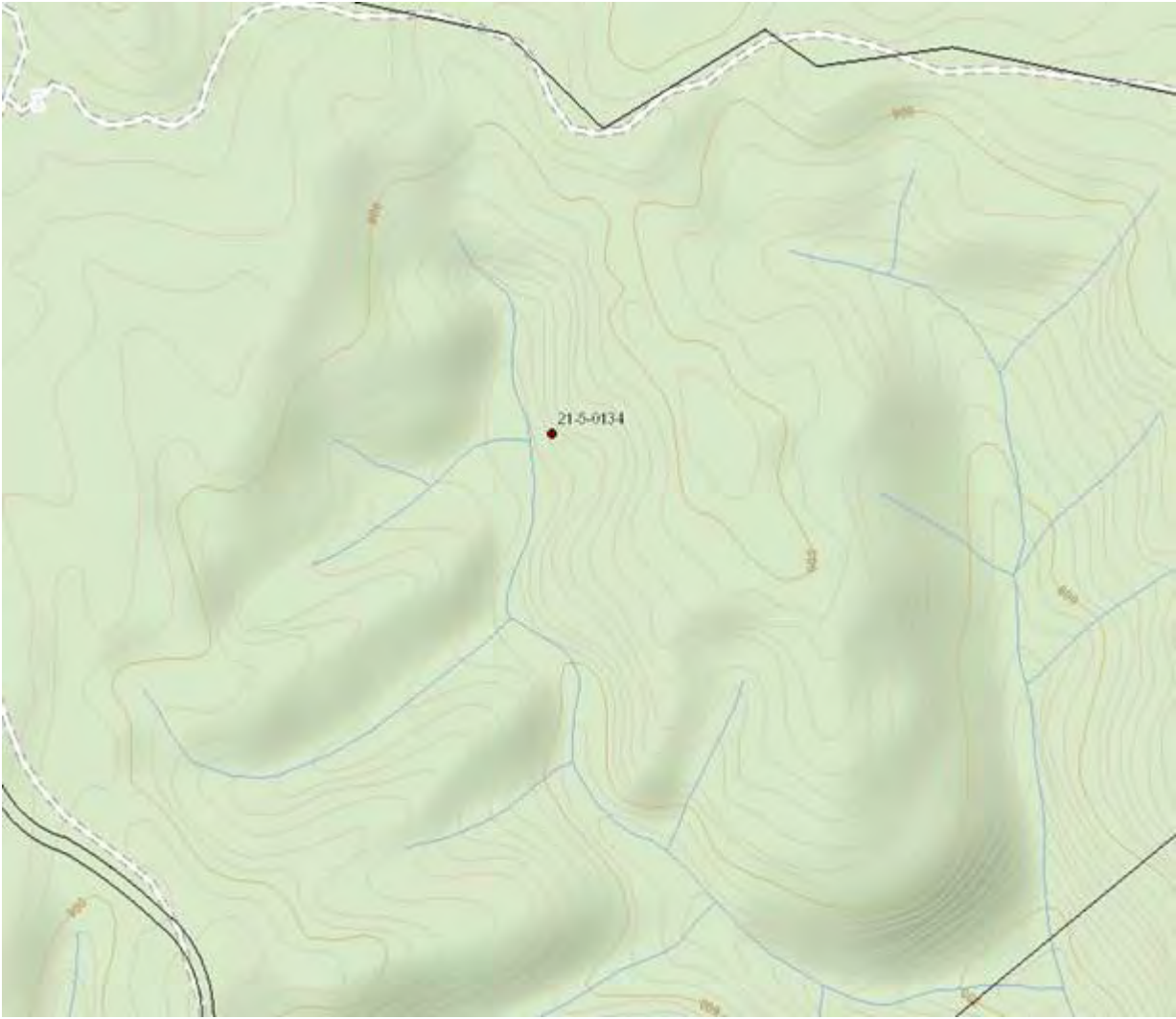
Further inquiry please contact Kempsey LALC or the site recorder Barry Cain

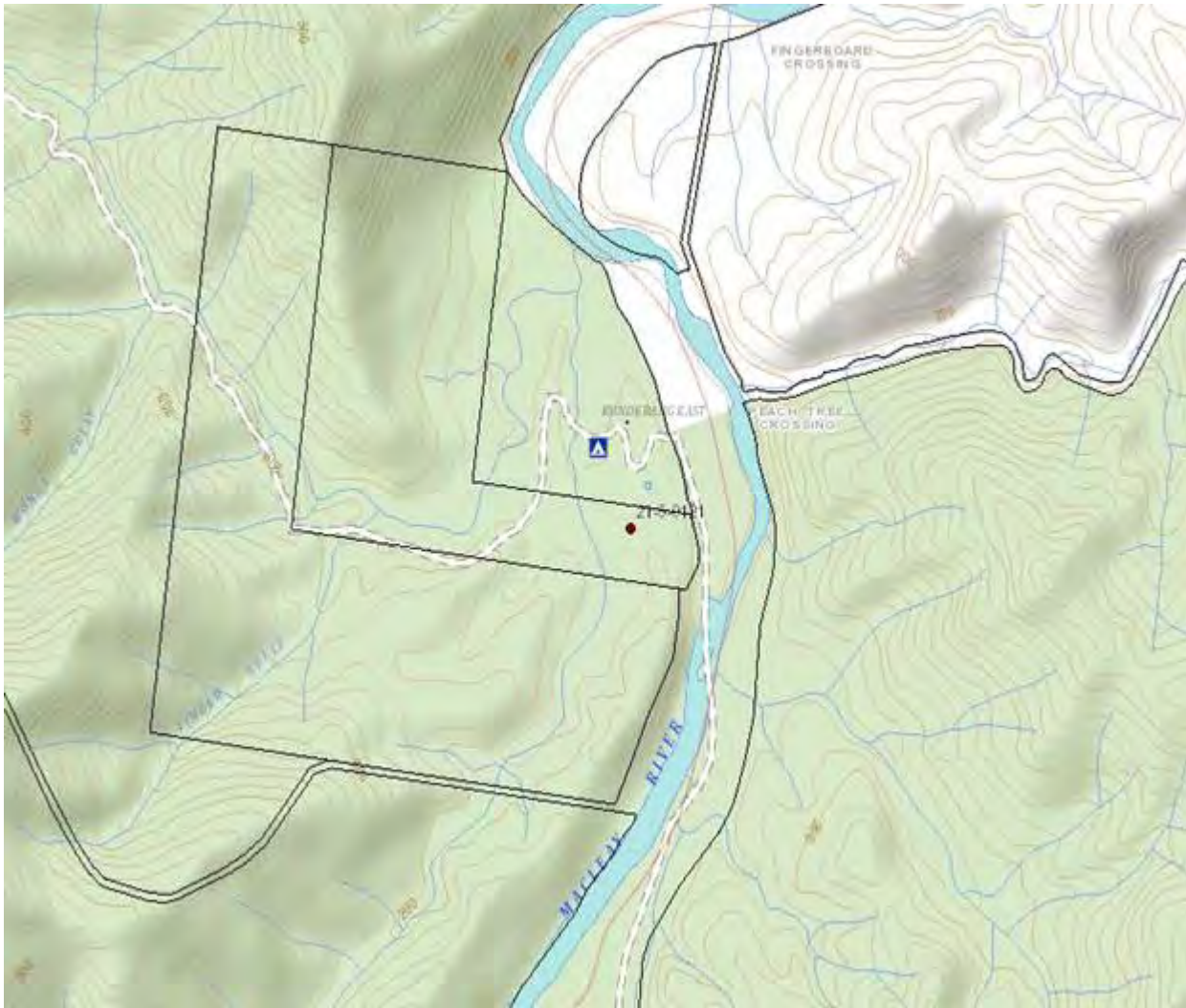
Please note: 21-5-0005 is a Male site and can only view by male officer or consultants. David will assist you with this I have 'cc' him to this email.

Kind regards
Eva









From: Taylor Reid <treid@emmconsulting.com.au>

Sent: Monday, 2 August 2021 12:07 PM

To: CCHD Information Systems & Assessment Mailbox <ahims@environment.nsw.gov.au>

Subject: Restricted Sites and Payment

Hello,

I have two requests.

I have completed and paid for an AHIMS extensive search and it has returned several restricted sites. Could you please let me know if any of the following sites are located within or close to the project area in the map attached to this email.

Restricted sites:

- 21-5-0137
- 21-5-0136
- 21-5-0134
- 21-5-0121
- 21-5-0005 Male site

I also paid for the extensive search, which went through successfully (receipt attached) but it still shows on my account that it hasn't been paid for yet. I was just wondering if there is something you can do to correct this from your side.

That's all for now, thank you!

Kind regards,

Taylor Reid

Archaeologist

Bushfire, Ecology, Heritage and Spatial Solutions



M 0428 280 542

T 02 4907 4828

 Connect with us

NEWCASTLE | Level 3, 175 Scott Street, Newcastle NSW 2300



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Brigitta Fowler

From: David Gordon <David.Gordon@environment.nsw.gov.au>
Sent: Wednesday, 4 August 2021 12:47 PM
To: Alan Williams
Subject: FW: Restricted Sites and Payment

CAUTION: This email originated outside of the Organisation.

Hey Al,

How are you brother?

We don't have the Card but AHIMS says it was recorded in 1982 and we don't know by who.

All we have is the electronic record as in the AHIS below:

The screenshot shows the 'Site Entry' form in the AHIS system. The form is titled 'Site Entry' and has a title bar with 'Site Entry' and window control buttons. The main content area is divided into several sections:

- Site Name:** Carrai Waterholes
- Site ID:** 21-5-0005
- Restrictions:** Gender: Male (dropdown), General: , Location:
- Status:** Validity: Valid (dropdown), Management: Not Managed (dropdown), Open to Public?: , Photograph Received?: , Permit Lapsed?:
- Open Site:** (selected)
- Enclosed Shelter:**
- Potential duplicate of:** (empty field)
- Navigation Bar:** Permits, Associations, Management, Condition, Aboriginal Place, Comments, HR Method, Project, Comm. Contact, Geographics, Context, Contacts, Recording, Reports, Features, Environment, Inspections, Photographs
- Grid Reference:** Datum: AGD (Australian Geodetic Datum) (dropdown), Zone: 56 (dropdown), Easting: 424000, Northing: 6588200, Map Sheet: CARR3N (dropdown), Location Method: 1:250,000 (Metric) (dropdown)
- Location:** LALC: THUNGGUTTI (dropdown), LGA: ARMIDALE REGIONAL (dropdown), Area: New England (dropdown), Branch: Northern Inland Branch (dropdown), Estate: Carrai State Conservation Area (dropdown), ROG: North West (dropdown), LLS: NORTHERN TABLELANDS (dropdown), BFRMC: New England (dropdown), Heritage Ops: North East [NORTH] (dropdown)

If you need anything more just let me know.

David

From: Taylor Reid <treid@emmconsulting.com.au>
Sent: Wednesday, 4 August 2021 12:43 PM
To: CCHD Information Systems & Assessment Mailbox <ahims@environment.nsw.gov.au>
Cc: David Gordon <David.Gordon@environment.nsw.gov.au>
Subject: RE: Restricted Sites and Payment

Hi Dave,

If possible, could you please contact Alan regarding the male only site 21-5-0005, his email (as I'm sure you know) is awilliams@emmconsulting.com.au

Is it also possible to have GPS coordinates of the restricted sites, or shape files of their locations provided to us? This can just be used internally, or with restricted information/access – or is this something we need to contact the LALC about? We want to ensure there are no activities occurring in the areas as this is a very large CSSI proposed project with many elements.

Thanks again!

Kind regards,

Taylor Reid

Archaeologist

Bushfire, Ecology, Heritage and Spatial Solutions



M 0428 280 542

T 02 4907 4828

 Connect with us

NEWCASTLE | Level 3, 175 Scott Street, Newcastle NSW 2300



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From: Eva Day <Eva.Day@environment.nsw.gov.au> **On Behalf Of** CCHD Information Systems & Assessment Mailbox
Sent: Wednesday, August 4, 2021 12:22 PM
To: Taylor Reid <treid@emmconsulting.com.au>
Subject: RE: Restricted Sites and Payment

CAUTION: This email originated outside of the Organisation.

Hi Taylor,

I have updated your payment. You will not receive invoice on this.

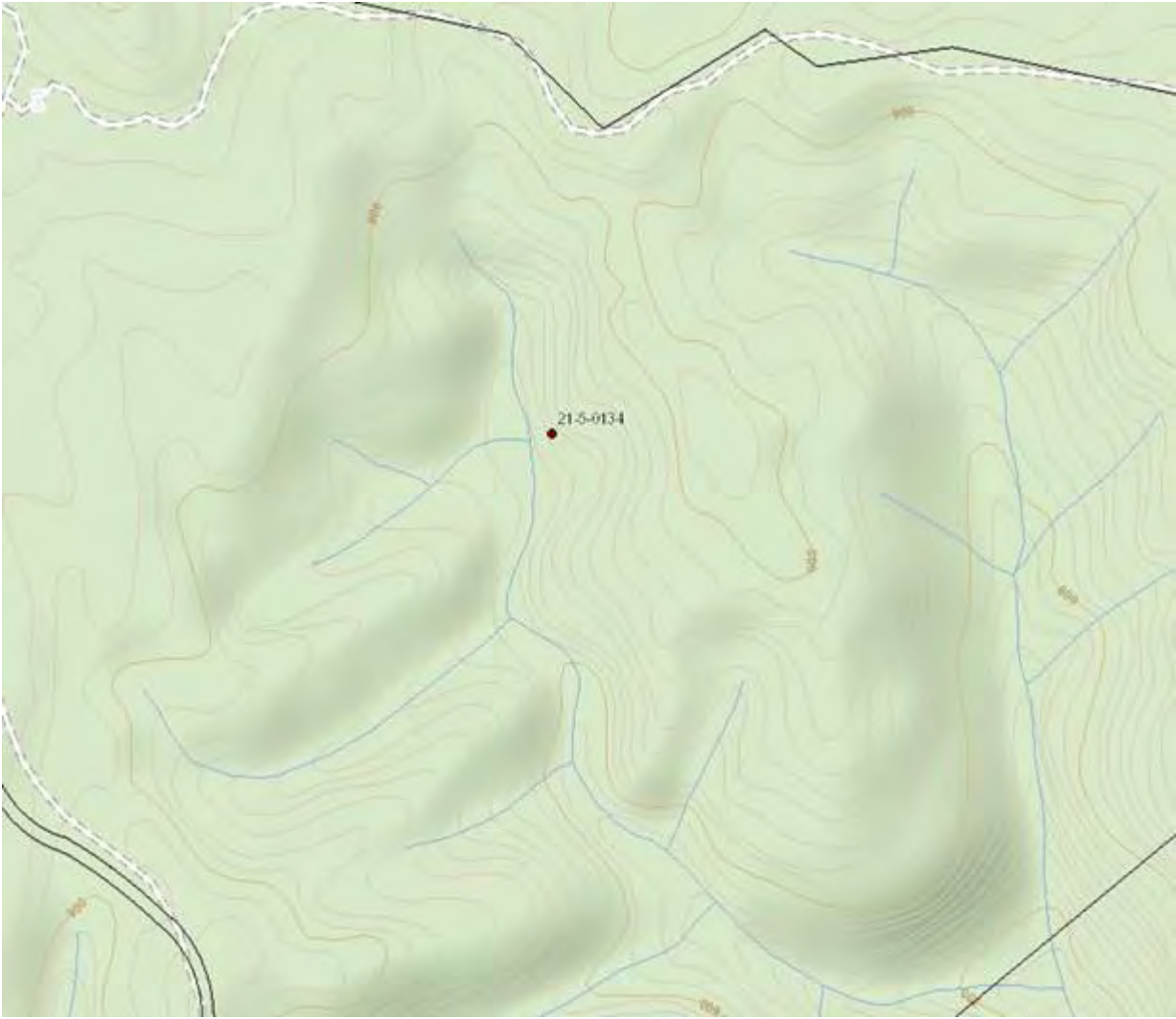
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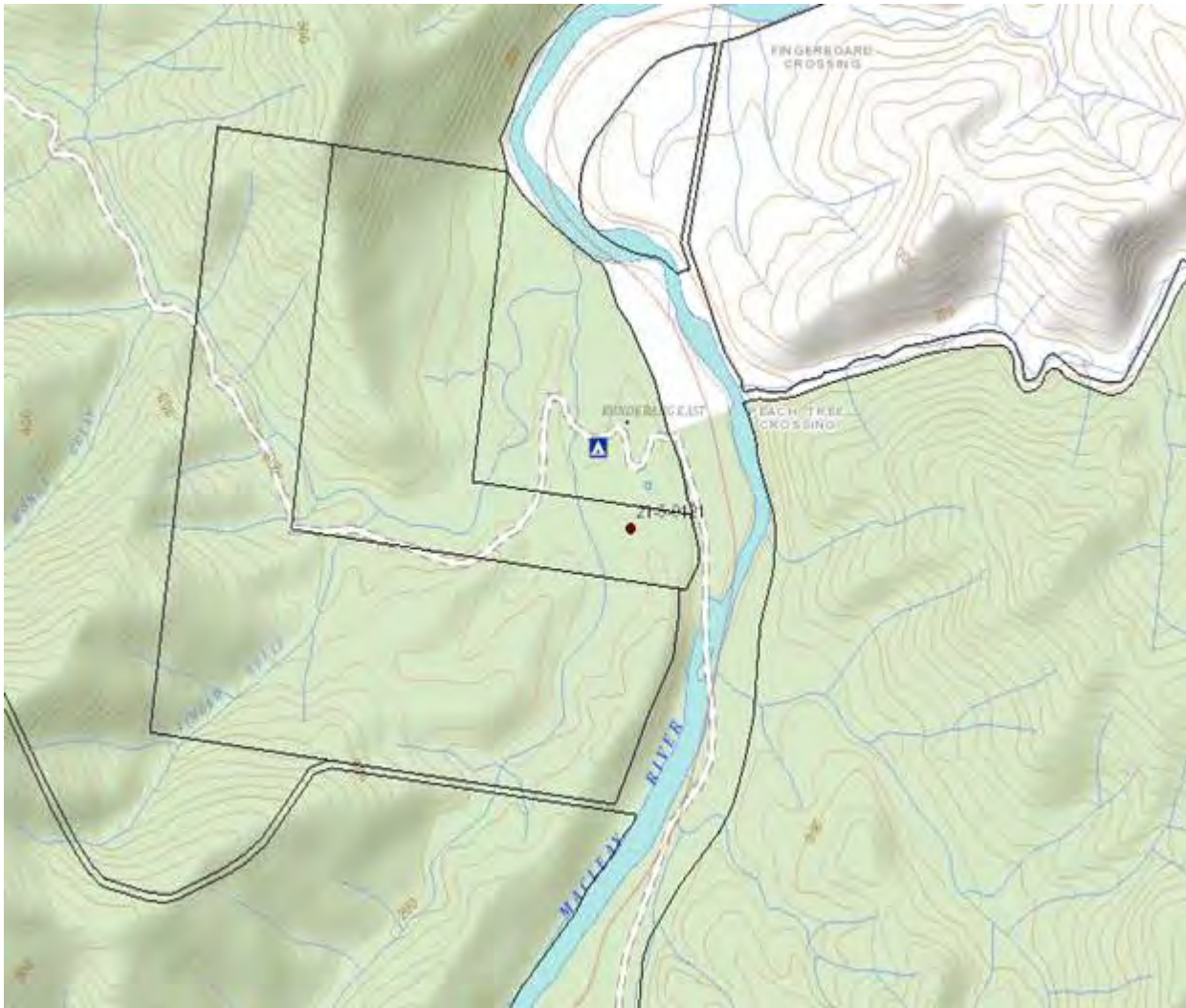
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Eva









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Sent: Monday, 2 August 2021 12:07 PM

To: CCHD Information Systems & Assessment Mailbox <ahims@environment.nsw.gov.au>

Subject: Restricted Sites and Payment

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Taylor Reid

Archaeologist

Bushfire, Ecology, Heritage and Spatial Solutions



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 Connect with us

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Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID:

Date recorded:

Site Location Information

Site name:

Easting: Northing: Coordinates must be in GDA (MGA)

Horizontal Accuracy (m):

Zone: Location method:

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
<input type="text" value="Mr"/>	<input type="text" value="Ahoy"/>	<input type="text" value="Steven"/>

Organisation:

Address:

Phone: E-mail:

Site Context Information

Land Form Pattern: Land Use:

Land Form Unit: Vegetation:

Distance to Water (m): Primary Report:

How to get to the site:

Other site information:

Site location map



Site contents information

open/closed site:

Site condition:

Features:

1.

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

Description:

Gathering place for young men entering ceremony

Features:

2.

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="Oval"/>	<input type="text" value="Box"/>

Description:

Scarred tree with axe present

Features:

3.

Number of features Length of feature(s) extent (m) Width of feature (s) extent (m)

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Features:

4.

Number of features Length of feature(s) extent (m) Width of feature (s) extent (m)

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Features:

5.

Number of features Length of feature(s) extent (m) Width of feature (s) extent (m)

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Other Site Info:

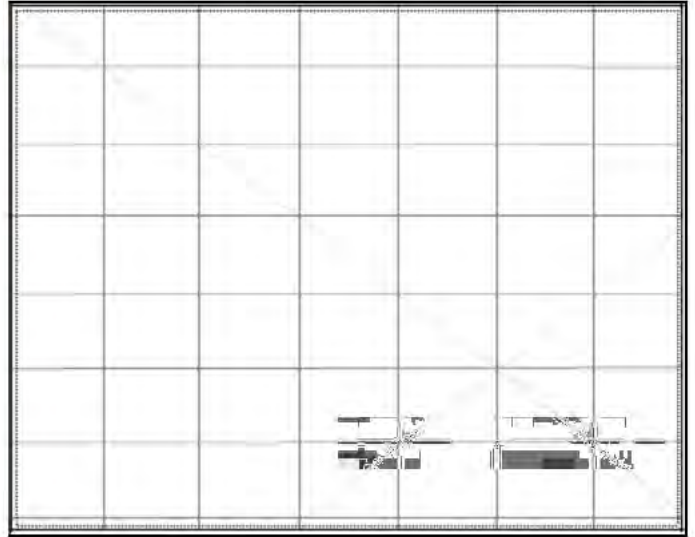
Site plan



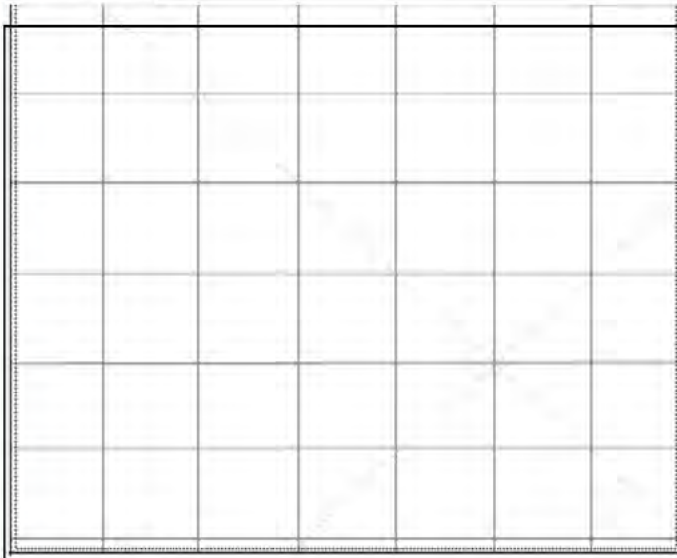
Site photographs



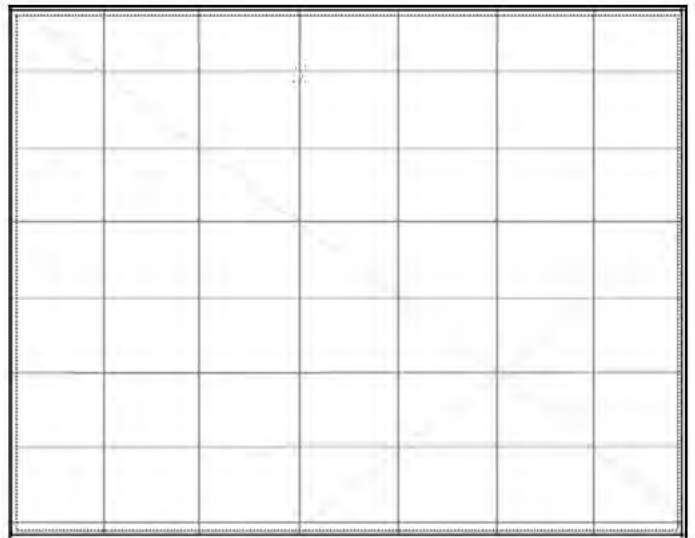
Description:



Description:



Description:



Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

Title Surname First name

Organisation:

Address:

Phone: E-mail:



Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID:

Date recorded:

Site Location Information

Site name:

Easting: Northing: Coordinates must be in GDA (MGA)

Horizontal Accuracy (m):

Zone: Location method:

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(The person responsible for the completion and submission of this form)

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<input type="text" value="Mr"/>	<input type="text" value="Ahoy"/>	<input type="text" value="Steven"/>

Organisation:

Address:

Phone: E-mail:

Site Context Information

Land Form Pattern: Land Use:

Land Form Unit: Vegetation:

Distance to Water (m): Primary Report:

How to get to the site:

Other site information:

Site location map



Site contents information

open/closed site:

Site condition:

Features:

1.

Number of features: Length of feature(s) extent (m): Width of feature (s) extent (m):

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

154 stone Axes

Features:

2.

Number of features: Length of feature(s) extent (m): Width of feature (s) extent (m):

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Features:

3.

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Features:

4.

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Features:

5.

Scarred Trees			
Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Description:

Other Site Info:

154 Axes and a very large number of other Artefacts present

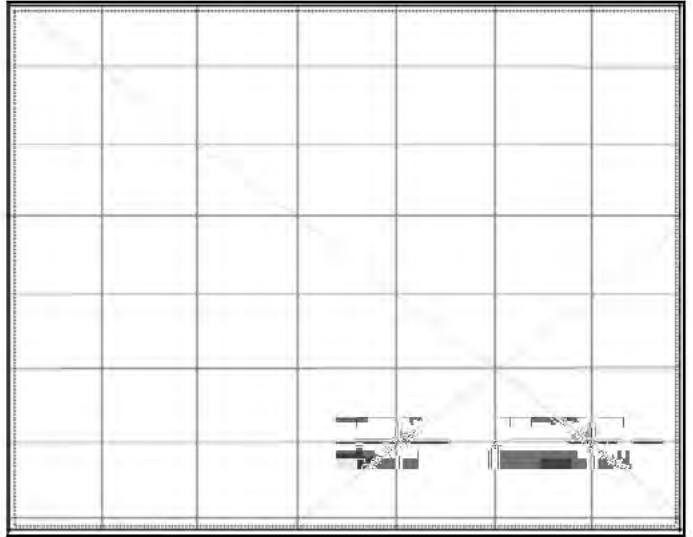
Site plan



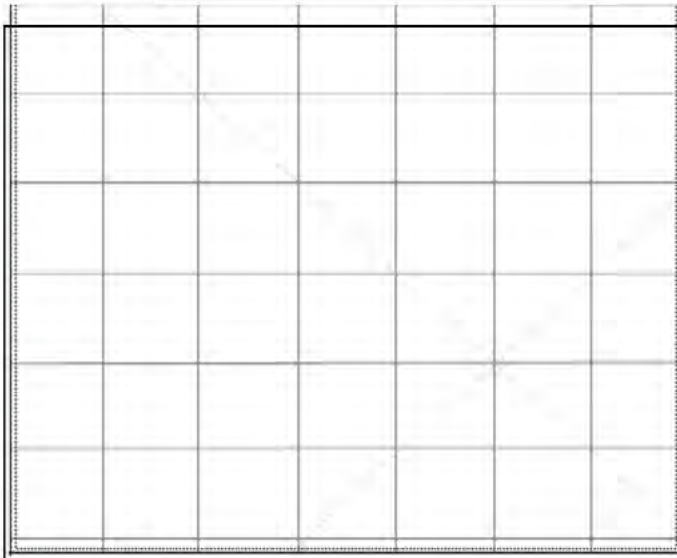
Site photographs



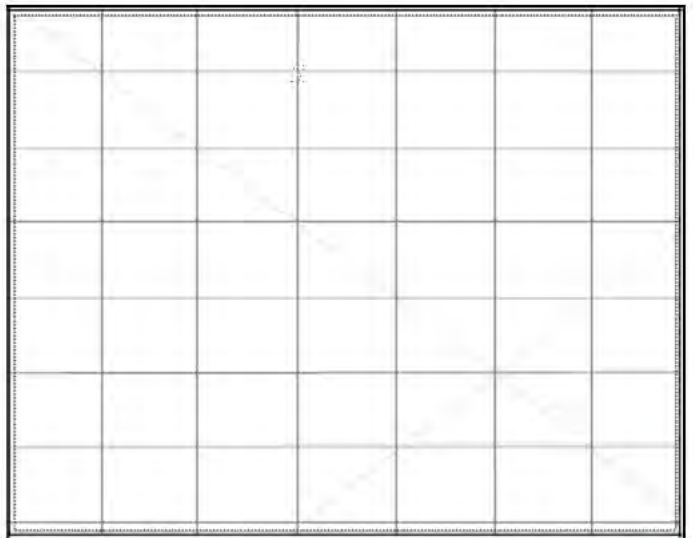
Description:



Description:



Description:



Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

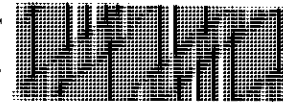
Title Surname First name

Organisation:

Address:

Phone: E-mail:

1. Map Name DORRIGO CARRAI 5. Site No. 21-5-11
 2. Scale 1:250,000 1:100,000 6. Site type STONE ARRANGEMENT
 (POSSIBLY ABORIGINAL)
 3. Grid ref 522185 190:907
 4. Site name(s) 4198.5897 KUNDERANG STATION 7. Classification

8. Air photo ref
 9. Cadastral
 10. Land Status Private 11.  21-5-0011

12. Directions for site relocation
 See owner of Kunderang Station, McLeay River, 40 miles NW of Kempsey

13. Owner 14. Tenant/Manager
 Address Address
 Attitude Attitude

15. Site Description stone arrangement.
 See attached copy of submission dated 3/2/76 to Mike Pearson from
 Glen Morris.
 No further information has come to hand to say whether it
 is aboriginal or European.

16. Reasons for investigation Suspected Aboriginal stone arrangement.
 17. Condition
 18. Interpretation
 19. Visitation
 20. Recommendations

21. Environmental description of site locality

22. Relation to other sites in locality

23. Details of artifact collections

24. Is plan or diagram of site attached? Yes/No

25. Are annotated photographs attached? Yes/No How many?

26. Other additions

27. Importance of site to Aborigines

28. Source of this information

29. Oral sources of information

30. Written references

31. Recorded by *Alan Morris* Filed by

Site Officer

Address

*NSW Aboriginal Sacred
Site Survey.*

Date

Date

21-5-11



NATIONAL PARKS AND WILDLIFE SERVICE

N.S.W. ABORIGINAL SACRED SITES SURVEY

INVESTIGATION REPORT - KUNDERANG STATION - MACLEAY RIVER

Accompanied by Howard Creamer and George Cohen on the 12 October, 1976, we investigated a stone arrangement with no origin on Kunderang Station on the Macleay River, 40 miles north west of Kempsey.

The site was shown to Mr George Cohen who is one of our Aboriginal consultants, by the property owner of Kunderang Station, which George worked on for about 25 years.

According to George, this site has no known Aboriginal significance, however the property owner says it's about 100 years old according to the previous owner. Could you possibly help us to identify its origin, (see photo below).

LOCATION DETAILS

Map ref.	Dorrigo	SH56-10	1:250,000	522185
			^{25,000} 100,000	
		Carrai Sheet 9336	1:100,000	190907

Glen Morris
Site Officer
N.S.W. Aboriginal Sacred Sites Survey

Mike Pearson,
N.P.W.S.
Service Historian

Photo showing George Cohen beside stone arrangement



ARMIDALE

SEE REPORT

C-1492

SITE 2:

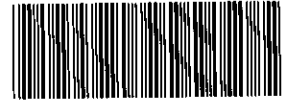
WILUNG-GAJAI

METRIC 4225.5972

- 1. Map Name Dorrigo SH 56-10 Carrai 9336-III-N 5. Site No. ... 21-5-23
- 2. Scale 1:250,000 1:25,000 6. Site type Natural
- 3. Grid ref 5247.1927 (4225.5972) 2227.9632 feature
- 4. Site name(s) "Georges Creek" 7. Classification

- 8. Air photo ref Area: Carrai, N.S.W. 1521, Run 5J, Nos.5081-82
- 9. Cadastral County Vernon, Parish Cochrane
- 10. Land Status River Reserve or TS & CR 11.

- 12. Directions for site relocation



21-5-0023

The increase site for catfish is located approximately 1 kilometre upstream in the Macleay River, from its junction with Georges Creek.

- Owner Crown Land 14. Tenant/Manager
- Address Address
- Attitude Attitude

15. Site Description

Wilung - gajai is a large rock in the Macleay River where ceremonies to increase catfish were performed, involving the use of white clay by smearing it onto the rock.

- 16. Reasons for investigation S.S.S.
- 17. Condition
- 18. Interpretation
- 19. Visitation
- 20. Recommendations

21. Environmental description of site locality

22. Relation to other sites in locality

23. Details of artifact collections

24. Is plan or diagram of site attached? Yes/No

25. Are annotated photographs attached? Yes/No How many?

26. Other additions

27. Importance of site to Aborigines

28. Source of this information

29. Oral sources of information

30. Written references

31. Recorded by

Filed by

Address

JPM

10/82

Date

Date

Appendix F

Field investigation

F.1 Survey transect information

Table F.1 Summary of each field survey transect undertaken

Transect #	Length (m)	Area (m ²)	Landform	Exposure (%)	Visibility (%)	Effective coverage (m ²)	Effective coverage (%)
OMPS T1	2,448	122,400	Hillslope	70%	10%	8568	7%
OMPS T2	2,807	140,350	Creekline	60%	20%	16842	12%
OMPS T3	2,215	110,750	Spurslope	20%	5%	1108	1%
OMPS T4	2,046	204,600	Creekline	60%	10%	12276	6%
OMPS T5	982	98,200	Creekline	50%	10%	4910	5%
OMPS T6	1,489	148,900	Creekline	50%	10%	7445	5%
OMPS T7	8,470	423,500	Hillslope	20%	10%	8470	2%
OMPS T8	1,587	79,350	Hillcrest	50%	5%	1984	3%
OMPS T9	2,837	283,700	Hillslope	50%	5%	7093	3%
OMPS T10	2,675	267,500	Spurcrest	50%	5%	6688	3%
OMPS T11	1,021	102,100	Hillslope	20%	5%	1021	1%
OMPS T12	1,204	60,200	Hillslope	60%	10%	3612	6%
OMPS T13	1,739	86,950	Hillslope	40%	20%	6956	8%
OMPS T14	1,061	53,050	Creekline	20%	10%	1061	2%
OMPS T15	2,006	200,600	Spurslope	60%	20%	24072	12%
OMPS T16	8,458	845,800	Hillslope	80%	90%	608976	72%
OMPS T17	2,882	288,200	Hillslope	60%	30%	51876	18%
OMPS T18	1,606	160,600	Hillslope	30%	10%	4818	3%
OMPS T19	1,269	63,450	Hillslope	70%	30%	13325	21%
OMPS T20	1,575	78,750	Spurslope	70%	30%	16538	21%
OMPS T21	2,452	122,600	Hillslope	70%	5%	4291	4%
OMPS T22	1,987	99,350	Ridge	70%	5%	3477	4%
OMPS T23	1,507	75,350	Hillslope	80%	5%	3014	4%
OMPS T24	4,593	459,300	Ridge	80%	10%	36744	8%
OMPS T25	1,254	62,700	Hillslope	70%	5%	2195	4%
OMPS T26	3,271	163,550	Spurslope	80%	10%	13084	8%
OMPS T27	5,008	250,400	Hillslope	80%	60%	120192	48%
OMPS T28	2,101	105,050	Hillslope	90%	10%	9455	9%
OMPS T29	1,000	50,000	Hillslope	30%	5%	750	2%
OMPS T30	1,283	64,150	Creekline	90%	60%	34641	54%
OMPS T31	3,396	339,600	Spurcrest	40%	5%	6792	2%

Table F.1 Summary of each field survey transect undertaken

Transect #	Length (m)	Area (m ²)	Landform	Exposure (%)	Visibility (%)	Effective coverage (m ²)	Effective coverage (%)
OMPS T32	4,656	465,600	Terrace	30%	5%	6984	2%
OMPS T33	1,811	90,550	Hillslope	70%	10%	6339	7%
OMPS T34	2,443	122,150	Ridge	90%	10%	10994	9%
OMPS T35	1,713	85,650	Hillslope	70%	5%	2998	4%
OMPS T36	2,034	101,700	Hillslope	70%	5%	3560	4%
OMPS T37	1,038	51,900	Creekline	80%	20%	8304	16%
OMPS T38	1,632	163,200	Hillcrest	80%	30%	39168	24%
OMPS T39	9,351	935,100	Plateau	50%	10%	46755	5%
OMPS T40	3,839	383,900	Hillslope	70%	10%	26873	7%
Total	106,746	8,010,750				1194244	15%
<i>Average</i>	<i>2,669</i>	<i>200,269</i>		<i>60%</i>	<i>16%</i>	<i>29,856</i>	<i>11%</i>

F.2 Identified Aboriginal sites

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
AHIMS 21-5-0142	Artefact scatter	Spurcrest	422866	6597350	Previously documented site recorded by Steve Ahoy (Iwatta Aboriginal Corporation). Approximately 70 artefacts were identified on a long exposure on a ridgeline of a steeply inclined spurcrest. The majority of artefacts were identified on the crest itself, with artefacts identified across an area 220 m (l) x 100m (w). This area was significantly more level, and gently inclined in a southeast direction. Visibility was generally poor in this locale with much of the area overgrown with native and invasive vegetation; though the crest of the spur was naturally eroded, thick leaf litter obscured much of the ground surface. Artefacts identified were diverse in type and included a number of hornfels axes and axe blanks, hammerstones, retouched artefacts, potential anvil (unknown material), chert core, jasper cobble/hammerstone, flakes and cores. Steve reported that visibility has decreased since initial recording, and that artefacts were originally observed on adjoining spurcrests and down the side slopes of the spur. A scar tree was also recorded in this locale (AHIMS #21-5-0143) however it could not be relocated at the time of survey. Due to the large number of axes and axe blanks identified here, many with water-rolled cortex where visible, it appears Aboriginal people were bringing cobbles from the Macleay up to the higher ground in order to manufacture these larger tool types. The site is located outside the project boundary.	Valid
OMPS-AS01	Artefact scatter	Creekline	419363	6593075	A low-density artefact scatter (~25 artefacts) located in a dry mouth of a creek bed that forms a first order tributary of the Macleay River. Visibility in the locale is very high, as it is located on a sandy bank of the Macleay River. Artefact types identified included hornfels cores, flakes, and retouched flakes. Additionally, Steve Ahoy (Iwatta Aboriginal Corporation) identified stone potentially used for ochre manufacture and a mula seed grinding stone. No subsurface potential was identified in this locale due to its location within an active waterway, were little subsurface. A number of silcrete river cobbles were identified, some flaked, suggesting raw material procurement from the Macleay River cobbles. The site is located outside the construction envelope.	Valid
OMPS-AS02	Artefact scatter	Terrace	419822	6593342	A very low-density artefact scatter (six artefacts) identified on and near a sheetwash exposure on a steep slope leading down to the Macleay River. The artefacts were identified in an area approximately 65m (l) x 60 m (w), though the exposure was significantly smaller. Artefacts identified included a jasper flake, hornfels river pebble core, and hornfels broken core. No substantial soil profile was identified in the area, where visibility was poor aside from exposures associated with outcropping rock, severely limiting the archaeological potential of the site. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS03	Artefact scatter	Spurslope	419969	6593100	Ten artefacts identified on and within the verge of a portion (100 m (l) x 35 m (w)) the site access track. Artefacts identified include a number hornfels flakes and a core. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located within the current disturbance footprint.	Valid
OMPS-AS04	Artefact scatter	Spurslope	420551	6593682	Three artefacts identified on a portion (100 m in length) of the site access track. Artefacts identified include two hornfels axe blanks and one hornfels flake. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS05	Artefact scatter	Hillslope	420826	6594283	A low-density artefact scatter (~12 artefacts) identified on an eroded area of sheetwash, with portions of outcropping granodiorite. The location of the site (100 m (l) x 35 m (w)) is on elevated ground overlooking the wide flood zone corridor of the Macleay River. Majority of artefacts identified were honfels flakes, however a blade and multidirectional core from the same material were also identified. No subsurface potential was identified at this locale, given the apparent shallow soils profiles observed at the time of survey. The site is located outside the construction envelope.	Valid
OMPS-AS06	Artefact scatter	Hillslope	422019	6595236	A very low-density artefact scatter (11 artefacts) identified on and within the verge of a portion (200 m (l) x 35 m (w)) the site access track. Artefacts identified include a number hornfels flakes and a potential scraper, a blueish red quartzite core, and a number of chert flakes and a core. Lenny Wright (Three Ducks Dreaming) identified the chert as being from the southern Sydney area. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located adjacent to the construction envelope.	Valid
OMPS-AS07	Artefact scatter	Hillcrest	422068	6595254	A low-density artefact scatter (~10 artefacts) identified on an eroded area of sheetwash, located on the upper slope of a hillcrest. The observations made at the time of survey suggested that the artefacts were eroding from the crest and moving downslope. As such, the artefacts were identified in an area 65 m (l) x 20 m (w), however this is likely larger than the actual site itself. Given these observations, limited subsurface potential was identified at this locale. Artefacts identified at this locale include a number of hornfels flakes, a core, and a milky quartz. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS08	Artefact scatter	Terrace	422232	6595537	Five artefacts identified on and within the verge of a portion (255 m (l) x 35 m (w)) of the site access track. Artefacts identified include a number hornfels flakes and few silcrete and chert cores. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located outside the construction envelope.	Valid
OMPS-AS09	Artefact scatter	Hillslope	422694	6596252	Seven artefacts identified along a portion (190 m in length) of the site access track, leading to Hay's Camp. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located within the current disturbance footprint.	Valid
OMPS-AS10	Artefact scatter	Spurcrest	422836	6596767	Five artefacts identified on a spurcrest overlooking the Macleay River. A number of the artefacts were identified within a sandy deposit on the edge of an ant hill but were also identified in small exposures nearby. The site area is approximately 50 m (l) x 25 m (w). The sandy deposit suggests some level of subsurface potential in this locale. Artefacts identified during the survey include hornfels flakes, quartzite core, and potential hornfels pestle with pitting on one end. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS11	Artefact scatter	Hillslope	422767	6597014	Three artefacts identified on a several erosion exposures on a hillslope. The artefacts were identified in an area approximately 35 m (l) x 10 m (w). Artefacts identified include a hornfels axe blank and possible hornfels cutting implement. Steve Ahoy (Iwatta Aboriginal Corporation) also identified a native grass (basket grass, <i>Lomandra longifolia</i>) nearby. This grass was an important resource plant for Aboriginal people. Grass blades were picked and hung to dry before weaving into baskets, mats, nets, etc. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS12	Artefact scatter	Spurcrest	422818	6597201	A low-density artefact scatter (~6 artefacts) identified within a small erosion scar on the moderate slopes of a spurcrest. The artefacts were identified with the exposure (5 m (l) x 5 m (w)). No other artefacts were identified in the immediate area, though visibility outside the exposure was very poor. Rock outcropping was observed in other areas near this locale, suggesting a shallow soil profile and little subsurface potential. Artefacts identified include a hornfels river pebble with pitting on one end, a hornfels blade, broken hammerstone (sedimentary rock), and a small number of hornfels flakes. The site is located outside the construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS13	Artefact scatter	Spurslope	422777	6597215	A low-density artefact scatter (~13 artefacts) identified on within a small erosion scar (20 m (l) x 10 m (w)) at the base of a young, burnt tree, located on the moderate slopes of a spur. No other artefacts were identified in the immediate area, though visibility outside the exposure was very poor. Rock outcropping was observed in other areas near this locale, suggesting a shallow soil profile and little subsurface potential. Artefacts identified include a broken hornfels hammerstone, and a potential siltstone grinding dish. The site is located outside the construction envelope.	Valid
OMPS-AS14	Artefact scatter	Spurcrest	423193	6597291	Three artefacts identified on a small erosion scar and ant hill, located on the relatively level crest of a spur. The exposed area was long and narrow (45 m (l) x 5 m (w)), but very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity. In addition, rock outcropping was observed in other areas near this locale, suggesting a shallow soil profile and little subsurface potential. Artefacts identified in this locale included two milky quartz flakes and a flaked river cobble (hornfels, possibly hornfels). The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS15	Artefact scatter	Spurcrest	423265	6597379	Three artefacts identified on a spurcrest within a large area affected by sheetwash erosion. While the exposed area was relatively large (50 m (l) x 30 m (w)), it was very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity. In addition, rock outcropping was observed in other areas near this locale, suggesting a shallow soil profile and little subsurface potential. Artefacts identified in this locale included a river cobble (volcanic material), a broken hornfels axe blank, and a siltstone core. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS16	Artefact scatter	Creekline	424314	6597067	A small number of artefacts (n=5) identified in a creekline, having likely washed in from moderate slopes located on either side of the channel. The artefacts were identified with a long, narrow portion of the creekline, measuring approximately 90 m (l) x 15 m (w). The creekline was flowing at the time of survey, likely only due to recent heavy rain. Visibility outside the creekline itself was generally poor due to thick grass cover. Given the incised nature of the creek, and the observation at time of survey that the artefacts have likely washed in from higher points, no subsurface potential was identified at this site. Artefacts identified included a silcrete core, a retouched chert flake, a hornfels ground-edge axe, a broken hornfels hammerstone, and a hornfels axe with retouch. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS17	Artefact scatter	Creekline	426995	6597076	A number of artefacts (n=10) identified in a dry creekline, having likely washed in from the slopes of surrounding gentle to moderate slopes. The artefacts were identified with a relatively short, narrow portion of the creekline, measuring approximately 35 m (l) x 15 m (w). Visibility outside the creekline itself was generally poor due to thick grass cover. Given the incised nature of the creek, and the observation at time of survey that the artefacts have likely washed in from higher points, no subsurface potential was identified at this site. Artefacts identified include a number of hornfels flakes, some with retouch, two hornfels axe blanks, and two milky quartz flakes. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS18	Artefact scatter	Spurcrest	428938	6598389	Eight artefacts identified on and within the verge of a portion of the site access track (290 m (l) x 35 m (w)). Artefacts identified include a number hornfels flakes and cores, flaked river pebbles (volcanic material), and a small number of milky quartz flakes. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS19	Artefact scatter	Spurcrest	429294	6598734	Five artefacts identified on several small exposures at the base of some young trees. While the area within which artefacts were identified was relatively large (50 m (l) x 30 m (w)), it was very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity. Some subsurface potential in this locale was noted in this locale. Artefacts identified included a hornfels axe blank, and a number of flaked river cobbles and jasper hammerstones. The site is located outside the construction envelope.	Valid
OMPS-AS20	Artefact scatter	Spurcrest	429401	6598981	Approximately 20 artefacts identified on an erosion scar on a spurcrest; artefacts were also observed on small exposures on the surrounding slopes. While the area within which artefacts were identified was relatively large (95 m (l) x 95 m (w)), it was very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity. hornfels flakes and cores, white chert flakes, jasper flakes and hammerstones. Several natural jasper boulders were observed; however no modifications were observed that would suggest this was a quarried resource. The site is located outside the construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS21	Artefact scatter	Hillslope	429452	6599120	Two artefacts, identified some distance apart (~60 m), located on the side of a moderate to steep hill. Observations at the time of survey suggested that the artefacts may have washed downslope from the hillcrest above. Given that the artefacts have likely washed in from higher points, no subsurface potential was identified at this location. Poor visibility (tall grasses) likely reduced the ability to identify other artefacts that may have washed downslope in this vicinity. Artefacts identified at the time of survey included a broken hornfels hammerstone and manuport (river cobble). The site is located outside the construction envelope.	Valid
OMPS-AS22	Artefact scatter	Terrace	429469	6599704	Three artefacts identified within an area of patchy erosion exposure, located on a relatively flat to gently sloped terrace with deeply incised, low order tributaries of the Macleay River in either side. While the area within which artefacts were identified was relatively large (45 m (l) x 20 m (w)), it was very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity if present. Some subsurface potential identified in this locale; however it is unclear how flooding may have affected the area. Artefacts identified include a broken hornfels hammerstone, hornfels core with multiple platforms and two negative scars, and a single hornfels flake. Rock outcropping observed in this location suggests a relatively shallow, rocky soil profile. This site is located outside the construction envelope.	Valid
OMPS-AS23	Artefact scatter	Terrace	430448	6597571	Six artefacts identified on a patchy erosion scar, located on a relatively flat to gently sloped terrace with deeply incised, low order tributaries of the Macleay River in either side. Artefacts were also observed on small exposures on the surrounding slopes that lead to these tributaries. While the area within which artefacts were identified was relatively large (100 m (l) x 25 m (w)), it was very obscured by dense leaf litter. The poor visibility likely reduced the ability to identify other artefacts in the vicinity if present. Some subsurface potential identified in this locale, however it is unclear how flooding may have affected the area. Some soils, near to the waterways, were highly eroded, likely due to natural washdown processes. Artefacts identified include a number of hornfels flakes, manuport (river cobble), and a river pebble core. A large siltstone chopper was identified, with possible course retouch on one margin - however, due to the soft nature of the material, this could be the result of natural processes. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS24	Artefact scatter	Terrace	430595	6597497	Two artefacts, identified some distance apart (~15 m), located on a small erosion scald on a relatively flat to gently sloped terrace with deeply incised, low order tributaries of the Macleay River in either side. Visibility at this locale was poor due to dense leaf litter, so likely reduced the ability to identify other artefacts in the vicinity, if present. Some subsurface potential identified in this locale, however it is unclear how flooding may have affected the area. Some soils, near to the waterways, were highly eroded, likely due to natural washdown processes. Artefacts identified include a river pebble (likely hornfels) with flaking, and flake with retouch. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS25	Artefact scatter	Terrace	430823	6597619	A low-density artefact scatter (~15 artefacts) identified on a large erosion scald. The site straddled a relatively flat to gently sloped terrace with deeply incised, low order tributaries of the Macleay River in either side. The site area is approximately 110 m (l) x 65 m (w). Visibility in this locale was relatively high compared to other areas, however general leaf litter and debris from recent poor weather likely reduced the ability to identify further artefacts in the locale if present. Some subsurface potential identified in this locale, however it is unclear how flooding may have affected the area. Some soils, near to the waterways, were highly eroded, likely due to natural washdown processes. Artefacts identified include a number of hornfels flakes, some with retouch, quartz and quartzite (poor quality) cores, a hornfels chopper, a broken anvil, and hammerstone with evidence of usewear (in the form of pitting). The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS26	Artefact scatter	Terrace	431291	6597939	An extensive stone artefact scatter (>100 artefacts) identified on relatively flat to gently sloped terrace abutting the Macleay River. Artefacts were identified within an area approximately 500 m (l) x 200 m (w) and were observed in area of patchy exposure interspersed between areas of thick grass cover. Artefact types include axes, anvils, hammerstones, flakes and cores. Stone materials include chert, jasper, quartz, quartzite, silcrete and hornfels. In some areas, observations made by RAPs at the time of survey indicated that some compositions could be interpreted as knapping events. RAPs participating in the survey flagged this area as very culturally significant. The site is located outside the current construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS27	Artefact scatter	Hillslope	431746	6597743	Nine artefacts identified on a long but narrow (200 m (l) x 15 m (w)) portion of an animal track and adjoining erosion scalds on the lower slope of a low hill, which goes on to the alluvial flats to the north. Visibility at this locale was poor due to dense leaf litter, so likely reduced the ability to identify other artefacts in the vicinity, if present. Due to the landform, it is likely the soils in this area are colluvial, so some archaeological potential is noted here. Artefacts identified include a number of hornfels flakes, some with retouch, cores, flaked river pebbles, broken hammerstone, sandstone grinding stone. The site is located adjacent to, but outside, the current construction envelope.	Valid
OMPS-AS28	Artefact scatter	Hillslope	422609	6598362	Two broken manuports identified in proximity (<5m apart) on a disused access track. The access track has been historically cut into the side of a moderate to steeply sloped hill, and the soils exposed suggest a gravelly clayey skeletal topsoil, over subsoils, severely limiting the archaeological potential of the site. Given the disturbance and the slope observed, it is unlikely that these artefacts are in situ. The site is located within the current disturbance footprint.	Valid
OMPS-AS29	Artefact scatter	Hillslope	422699	6598460	Two artefacts identified some distance apart (~35 m) on a section of severe washout on the side of a hillslope. Within the erosion scald, visibility was considered very good. Given the context within which the artefacts were identified, there is likely little subsurface potential in this locale. Artefacts identified include a broken hornfels manuport and a milky quartz flake. The site is located within the current disturbance footprint.	Valid
OMPS-AS30	Artefact scatter	Spurslope	422934	6598511	Three artefacts identified some distance apart, within an area of 55 m (l) x 15 m (w), on a rocky, steep spurslope. The artefacts were identified in patchy areas of erosion, however general visibility was poor due to thick grass cover and leaf litter. In addition, rock outcropping was observed in other areas near this locale, suggesting a shallow soil profile and little subsurface potential. Artefacts identified include two hornfels flakes and a core. The site is located within the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS31	Artefact scatter	Ridge	424612	6601193	Two artefacts identified on a washed-out portion of a disused access track that runs along the ridgeline of the mountains. The artefacts were identified in a small area (1 m ²), however outside the small exposure visibility was poor. While the topsoils in this locale appeared humic, outcropping rock observed along the ridgeline suggests very little subsurface soil profile. Artefacts identified here include a small hornfels flake with retouch and a small quartzite flake. The site is located inside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS32	Artefact scatter	Ridge	424989	6601738	Two artefacts, identified some distance apart (~50 m), located on a portion of a disused access track that runs along the ridgeline of the mountains. Artefacts identified include a hornfels flake and a milky quartz flake. The artefacts were identified in small exposure, however visibility between the two sites was generally very poor with dense vegetation and leaf litter. While the topsoils in this locale appear humic, outcropping rock observed along the ridgeline suggests very little subsurface soil profile. The site is located inside the current disturbance footprint.	Valid
OMPS-AS33	Artefact scatter	Ridge	425129	6602013	A low-density artefact scatter (~25 artefacts) identified on a portion of a disused access track that runs along the ridgeline of the mountains. The artefacts were identified on a long but narrow area (285 m (l) x 30 m (w)) both on and within the verge of the access track. The artefacts were identified in patchy areas of erosion, however general visibility was poor due to thick grass cover and leaf litter. While the topsoils in this locale appear humic, outcropping rock observed along the ridgeline suggests very little subsurface soil profile. Artefacts identified include a hornfels chopper, and a number of flakes and cores of the same material. The site is located inside the current disturbance footprint.	Valid
OMPS-AS34	Artefact scatter	Ridge	425512	6602278	Three artefacts identified within a ~65 m portion of an access track. Compared to other areas of the same track, this portion appears to have seen recent use which has improved visibility somewhat. Artefacts identified include a hornfels axe blank and a milky quartz core. As with other sites on the ridgeline, while the topsoils in this locale appear humic, outcropping rock observed along the ridgeline suggests very little subsurface soil profile. The site is located within the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS36	Artefact scatter	Terrace	422368	6597332	An extensive artefact scatter (>60 artefacts) located on an alluvial terrace at southwest corner of the junction where George's Creek meets the Macleay River (a location known as Georges Junction). The artefacts comprise a number of materials, including hornfels (dominant), quartz, quartzite, chert, and red jasper. Some potential post-contact artefacts were identified, comprised of purple bottle(?) glass, and glazed ceramic (isolator). Artefact types included axes, hammerstones, flakes, retouched flakes, cores, anvils with usewear, and scrapers. Notably, a ground edge axe (hornfels) was identified by Lachlan King (Thunggutti LALC) in the southern portion of the scatter. This site is located outside the construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS37	Artefact scatter	Plateau	422986	6591301	A low-density artefact scatter (~14 artefacts) near a granodiorite outcrop comprised of massive (>2 m) boulders. The headwaters of a first order waterway are mapped in this location, however no defined stream channel was identified here. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. The artefacts were identified in small exposures interspersed between thick vegetation (60m (l) x 15m (w)). Artefacts identified here include a broken hornfels flake, and a cluster of milky and crystal quartz flakes. The site is located within the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-AS38	Artefact scatter	Plateau	422834	6591687	A potential hornfels core and associated shattered fragments (~6 total) located on a well-established access track. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. The artefacts were identified within a ~70 m length of the track where exposure was very good; off track, thick vegetation obscured visibility considerably. Given the position on the track, and the lack of diagnostic features on the artefacts, it is possible the find reflects vehicle damage rather than cultural modification. To enable use of the track without further damage to this site, and following consultation with Heritage NSW and RAPs, these artefacts were bagged and moved off the track and placed under a nearby tree. The site is located inside the current disturbance footprint.	Tentative
OMPS-AS39	Artefact scatter	Plateau	422012	6591120	A low-density artefact scatter (~18 artefacts) located on a well-established access track. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. Artefacts included flakes and cores comprised on jasper, hornfels and quartz. The artefacts were identified within a ~40 m length of the track where exposure was very good; off track, thick vegetation obscured visibility considerably. The site is located within the construction envelope, but outside the current disturbance footprint. To enable use of the track without further damage to this site, and following consultation with Heritage NSW and RAPs, these artefacts were bagged and moved off the track and placed under a nearby tree.	Valid
OMPS-AS40	Artefact scatter	Plateau	421906	6591075	This site consists of a number of flakes and cores (10 artefacts) identified on a well-established access track. Raw materials identified include quartz, hornfels and chalcedony. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. The artefacts were identified within a ~15 m length of the track where exposure was very good; off track, thick vegetation obscured visibility considerably. The site is located within the construction envelope, but outside the current disturbance footprint. To enable use of the track without further damage to this site, and following consultation with Heritage NSW and RAPs, these artefacts were bagged and moved off the track and placed under a nearby tree.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-AS41	Artefact scatter	Plateau	421951	659164	This site consists of several quartz flakes and one potential hornfels flake (10 artefacts) identified on a well-established access track. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. The track appeared well trafficked, and the artefacts were identified amongst natural quartz material, which may have been introduced as a stabilising material in periods of wet weather. The artefacts were identified within a ~120m length of the track where exposure was very good; off track, thick vegetation obscured visibility considerably, however some artefacts were identified in the road verge where erosion had improved visibility. The site is located outside the construction envelope. To enable use of the track without further damage to this site, and following consultation with Heritage NSW and RAPs, these artefacts were bagged and moved off the track and placed under a nearby tree.	Valid
OMPS-AS42	Artefact scatter	Plateau	421924	6591785	A low-density artefact scatter (~12 artefacts) near a granodiorite outcrop comprised of flat, exposed rock. The site is located on within a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. Artefacts identified were exclusively quartz flakes, as well as a few quartz cores. Visibility on the exposed rock was generally good, however some vegetation and moss growth across the expanse impacted visibility as a whole and the artefacts were identified in a fairly constrained area (10m (l) x 10m (w)). The site is located inside the current disturbance footprint.	Valid
OMPS-GG1	Grinding groove	Creekline	419632	6591634	A potential grinding groove identified by Steve Ahoy (Iwatta Aboriginal Corporation), located on a granodiorite rock boulder within the stream channel of a deeply incised third order tributary of the Macleay River. The creek was flowing at the time survey, at least in part due to recent heavy rain. The groove is small and shallow (16 cm (l) x 6 cm (w) x >2 cm (d)) and is located on a small but relatively flat boulder in the middle of the creekline; one end of the groove is not distinct, having been eroded away by water. RAP participants suggested that the grooves may have been used for sharpening spear tips or stakes. The dimensions, form and bedrock material would be atypical for more traditional grinding grooves recorded in south east NSW, though none have been recorded in this specific region to make a robust comparison. The site is located inside the current disturbance footprint.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF01	Isolated find	Terrace	419769	6593290	A single siltstone core flake (85 mm x 60 mm x 30 mm) identified on a disused access track. The artefact was identified in small, patchy exposure, however visibility in this locale was generally very poor with dense vegetation and leaf litter. Soils in this locale appear to be a coarse, colluvial sand (potentially degrading igneous bedrock), and retain some archaeological potential on the surrounding terrace landform. The site is located inside the current disturbance footprint.	Valid
OMPS-IF02	Isolated find	Spurslope	420124	6593219	A single hornfels hammerstone (150 mm x 110 mm x 30 mm) identified on an access track. The access track has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF03	Isolated find	Creekline	420753	6593960	A single flaked river pebble (hornfels; 110 mm x 60 mm x 40 mm) identified on an access track, by a creekline crossing. The creekline is comprised of flat granodiorite overlapping slabs, and was in flow at the time of survey, likely due to recent rain. The access track itself has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF04	Isolated find	Hillslope	420803	6594260	A milky quartz core (75 mm x 60 mm x 30 mm), possibly retouched, identified on a small exposure at the base of a young eucalypt tree. The general location of the site is on a steeply sloped hill, and visibility outside the locale was generally very poor with dense vegetation and leaf litter. The site is located outside the construction envelope.	Valid
OMPS-IF05	Isolated find	Creekline	421149	6594309	A retouched hornfels chopper (105 mm x 85 mm x 50 mm) identified on an access track; the artefact showed signs of recent damage, possibly by vehicle movement. The headwaters of a first order waterway is mapped near this location (~15m east) however observations suggest this is more a depression in the landscape at this section, rather than an established watercourse. The access track itself has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF06	Isolated find	Creepline	421277	6594420	A broken hornfels hammerstone (120 mm x 100 mm x 40 mm) identified on an access track, by a creepline crossing. The confluence of two headwaters forming a second order waterway is mapped near this location (~10m east), however observations suggest this is more a depression in the landscape at this section, rather than an established watercourse. The access track itself has been recently regraded, which has improved visibility along the track but has further disturbed the low-density scatter that has been identified in various sections. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF07	Isolated find	Hillslope	421447	6594323	A hornfels axe blank (140 mm x 95 mm x 60 mm) identified on a steep, densely vegetated hillslope. Observations made during the survey suggest the artefact likely slipped down from upper crest (~60m southeast). The artefact was identified within a densely vegetated area, and given the extremely poor visibility in this area, the artefact was identified primarily on the basis of its obtrusiveness and large size. The headwaters of a first order waterway are mapped on this location, however observations suggest this is more a depression in the landscape at this section, rather than an established watercourse. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF08	Isolated find	Hillslope	421527	6594680	A single hornfels flake (55 mm x 30 mm x 20 mm) identified on a sheetwash within the verge of an access track; the artefact showed signs of recent damage, possibly by vehicle movement. The access track has been historically cut into the side of a steeply sloped hill, and the soils exposed suggest a coarse clayey sand, over rocky subsoils, severely limiting the archaeological potential of the site. Observations made during the survey suggest the artefact likely slipped down from upper crest (~50m southeast). The headwaters of a first order waterway area mapped on this location, however observations suggest this is more a depression in the landscape at this section, rather than an established watercourse. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF09	Isolated find	Hillcrest	422271	6595313	A broken hornfels axe (150 mm x 115 mm x 40 mm) identified on the edge of an ant nest. The artefact is located on a hillcrest, which slopes into a drainage depression ~20 m to the west of the site. The drainage depression is mapped as the headwaters of a first order waterway in this location, however observations suggest this is more a depression in the landscape at this section, rather than an established watercourse. The site is located inside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF10	Isolated find	Spurslope	422580	6596885	A broken hornfels artefact with retouch and pitting on one end, located on tree root exposure. The artefact is located on a moderate spurslope, which slopes into a drainage depression ~80 m to the northeast of the site. The creek, a rocky, narrow, second order channel, was flowing at the time of survey, likely due to recent heavy rain. Visibility outside the small exposure around the tree was extremely poor due to thick vegetation, and, where visible, soils in this locale appear thin and rocky. The site is located outside the construction envelope.	Valid
OMPS-IF11	Isolated find	Spurslope	422562	6596056	Heavily flaked hornfels axe (150 mm x 12 mm x 5 mm) identified on sheetwash exposure by a young tree. The artefact was located on a the midslope of a hill, which slopes down to an incised creekline to the south (~55 m). The creek, a rocky, narrow, second order channel, was flowing at the time of survey, likely due to recent heavy rain. Observations made during the survey suggest the artefact likely slipped down from upper crest (~80 m east). The site is located inside the current disturbance footprint.	Valid
OMPS-IF12	Isolated find	Hillslope	422704	6596460	A small hornfels flake (20 mm x 15 mm x >1 mm) identified on a patchy sheetwash on a steep hillslope. The artefact was identified in a small patchy area of erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Soils in this area appear to be coarse sandy gravel, possibly the same course, colluvial sand (potentially degrading igneous bedrock) observed in other areas. Identified in similar context and in proximity to OMPS-IF13 (~90 m east), which may reflect artefacts eroding from higher points to the southeast. The site is located outside the construction envelope.	Valid
OMPS-IF13	Isolated find	Hillslope	422797	6596446	A hornfels stone axe with retouch evident on ventral surface (120 mm x 100 mm x 40 mm) identified on a steep, densely vegetated hillslope. The artefact was identified within a densely vegetated area, and given the extremely poor visibility in this area, the artefact was identified primarily on the basis of its obtrusiveness and large size. Identified in similar context and in proximity to OMPS-AS12 (~70 m southwest), which may reflect artefacts eroding from higher points to the south east. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF14	Isolated find	Spurcrest	422813	6596834	A flaked hornfels river cobble (150 mm x 90 mm x 50 mm), possibly an axe blank, identified in a small tree well exposure. The artefact was identified in a small patchy area of erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Identified in similar context and in proximity to OMPS-IF12 (~90 m west), which may reflect artefacts eroding from higher points to the southeast. The site is located outside the construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF15	Isolated find	Hillcrest	423208	6596714	A potential hornfels river cobble fragment identified by RAP participants on a vehicle track, located adjacent to a small temporary camp (Hay's Camp) on a hillcrest. No artefactual features were identified on inspection, and the split is likely natural in origin. The site is located outside the construction envelope.	Tentative
OMPS-IF16	Isolated find	Creekline	422480	6596844	A hornfels axe (150 mm x 105 mm x 50 mm) identified on an access track. The track appeared well trafficked, resulting in good visibility in this locale. The site is located on the alluvial banks of the Macleay River, which before, during, and following fieldwork experienced major, intense flash flooding which scoured this locale. It is therefore unlikely that this artefact is in situ and suggests the alluvial deposit here may have been impacted over time by the hydrology of the Macleay. The site is located outside the construction envelope.	Valid
OMPS-IF17	Isolated find	Hillslope	422771	6597166	A potential hornfels core (260 mm x 75 mm x 40 mm) identified by RAP participants in a dry drainage depression near the crest of a steep hillslope. The artefact was identified within a densely vegetated area, and given the extremely poor visibility in this area, the artefact was identified primarily on the basis of its obtrusiveness and large size. No distinctive artefactual features were identified on inspection, and breaks observed may be a result of natural fracturing. However, given the hillslope context and proximity to OMPS-AS12 on a nearby crest (~60 m northeast), it is possible this find has washed down from higher points. The site is located outside the construction envelope.	Tentative
OMPS-IF18	Isolated find	Spurcrest	429122	6598711	A large hornfels axe with retouch on ventral surface (175 mm x 160 mm x 40 m) identified on an animal track. While the exposure on the animal track offered some visibility, it was densely obscured by thick leaf litter. The general context was a densely vegetated spurcrest, and given the extremely poor visibility in this area, the artefact was identified primarily on the basis of its obtrusiveness and large size. The site is located outside the construction envelope.	Valid
OMPS-IF19	Isolated find	Spurcrest	429218	6598934	A large multiplatform hornfels core (150 mm x 130 mm x 40 mm) identified on a patchy erosion scar on a level spurcrest. The artefact was identified in a small patchy area of erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Some further potential was identified here, due to the favourable landform. The site is located outside the construction envelope.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF20	Isolated find	Spurcrest	429386	6599311	A complete hornfels flake with retouch (130 mm x 110 mm x 20 mm) identified on a tree well exposure, on a gently sloped spurcrest. The artefact was identified in a small patchy area of erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Some further potential was identified here, due to the favourable landform. The site is located outside the construction envelope.	Valid
OMPS-IF21	Isolated find	Hillslope	430225	6597792	A multiplatform chert core (70 mm x 65 mm x 30 mm) identified on identified on a patchy erosion scar on a level spurcrest. The artefact was identified in a small patchy area of erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Some further potential was identified here, due to the favourable landform. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF22	Isolated find	Spurcrest	430902	6597716	A siltstone pebble (105 mm x 65 mm x 25 mm) with one negative scar on a small erosion scar, on a broad, flat terrace abutting the Macleay River. Due to the soft nature of the material, this could be the result of natural processes. General visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Some further potential was identified here, due to the favourable landform. The site is located outside the construction envelope.	Tentative
OMPS-IF23	Isolated find	Hillslope	431941	6597692	A broken hornfels core (200 mm x 95 mm x 40 mm) with retouch identified on the lower slopes of a hill, abutting a broad, flat terrace next to the Macleay River. The artefact was identified on an erosion scald resulting from a narrow animal track. General visibility both in and outside the exposure was poor due to thick grass cover and leaf litter erosion scald. As noted for other sites and isolated artefacts in the vicinity, archaeological potential is associated with the terrace landform in this locale. This site is located outside the construction envelope.	Valid
OMPS-IF24	Isolated find	Ridge	425785	6602285	A hornfels core (85 mm x 70 mm x 30 mm) identified on an access track that runs along and adjacent to the ridgeline of the mountains. The track appeared well trafficked, resulting in good visibility in this locale. Here, the access track has been historically cut into the side of a moderate to steeply sloped hill, and the soils exposed suggest a gravelly clayey skeletal topsoil, over subsoils, severely limiting the archaeological potential of the site. The site is located inside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF25	Isolated find	Ridge	426155	6601007	A potential hornfels flaked cobble identified by RAP participants on an access track that runs along and adjacent to the ridgeline of the mountains. The track appeared well trafficked, but still retains a decent layer of leaf litter, resulting in moderate visibility in this locale. No distinctive artefactual features were identified on inspection, and breaks observed may be a result of breakage due to vehicle movement or natural processes. The site is located inside the current disturbance footprint.	Tentative
OMPS-IF26	Isolated find	Ridge	426281	6600594	A hornfels river cobble (150 mm x 100 mm 5 0mm), potentially worked, identified near the access track that runs along and adjacent to the ridgeline of the mountains. The artefact was identified off the main track, but within 20 m, within a densely vegetated area, and given the extremely poor visibility, the artefact was identified primarily on the basis of its obtrusiveness and large size. Identifying distinctive artefactual features was difficult due to suspected heat shattering evident from past bushfires in the region. The site is located inside the current disturbance footprint.	Tentative
OMPS-IF27	Isolated find	Spurslope	425747	6600191	A very poor-quality cream silcrete flake (50mm x 30mm x 25mm) identified on an erosion scar, on a steeply sloped spur. General visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. Observations made at the time of survey, primarily due to the steepness of the terrain in this locale, suggest that the artefact has likely rolled down from a higher point. The site is located inside the construction envelope, but outside the current disturbance footprint.	Valid
OMPS-IF28	Isolated find, possibly post contact	Spurslope	422386	6597713	A potential post-contact artefact in the form of a piece of flaked white porcelain (possibly a teacup; 90 mm x 90 mm x 40 mm) located on a steep spurslope at the tree well at the base of a large, mature tree. General visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. No substantial soil profile was identified in the area, where visibility was poor aside from exposures associated with outcropping rock, severely limiting the archaeological potential of the site. The site is located outside the construction envelope.	Tentative
OMPS-IF29	Isolated find	Hillslope	428846	6598377	Small milky quartz flake (15 mm x 15 mm x 5 mm) identified on an access track. The track appeared well trafficked, resulting in good visibility in this locale despite thick leaf litter. Here, the access track has been historically cut into the side of a moderate to steeply sloped hill, and the soils exposed suggest a gravelly clayey skeletal topsoil, over subsoils, severely limiting the archaeological potential of the site. The site is located inside the current disturbance footprint.	Valid

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-IF30	Isolated find	Hillslope	428925	6598564	A large hornfels core with a single platform (190 mm x 165 mm x 40 mm) identified on a steep hillslope. The artefact was identified in a small patchy area of sheetwash erosion, however general visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. given the hillslope context and proximity to OMPS-AS18 on a nearby saddle (~90 m east), it is possible this find has washed down from higher points. The site is located outside the construction envelope.	Valid
OMPS-IF31	Isolated find	Plateau	422692	6591950	A small chert flake (50 mm x 40 mm x 20 mm) identified on a well-established access track. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. General visibility both in and outside the exposure was poor due to thick grass cover and leaf litter. The site is located inside the current disturbance footprint.	Valid
OMPS-IF32	Isolated find	Plateau	421892	6591714	A small quartz flake (30 mm x 20 mm x 10 mm) identified within a tree well exposure. The site is located on a relatively flat to gently undulating plateau, within the western portion of the Carrai Plateau. No substantial soil profile was identified in the area, where visibility was poor aside from exposures associated with outcropping rock, severely limiting the archaeological potential of the site. Approximately 5 m north, an extensive outcrop of shattered natural quartz was observed, this find could reflect a natural origin if associated. The site is located inside the current disturbance footprint.	Tentative
OMPS-Q1	Quarry, artefact scatter	Spurslope	418799	6591493	A potential hornfels quarry site identified on outcropping rock within a deeply incised creekline, near where it meets the Macleay River. A number of artefacts were recorded in the vicinity, and the site is approximately 70 m (l) x 40 m (w). Artefacts identified at the time of survey were predominantly hornfels flakes. Artefacts were identified away from the quarry, on the elevated terrace on the south bank. Visibility in this location was poor, with artefacts only identified in very small patches of wash out exposure. Some archaeological potential was identified in this locale. The site is located outside the construction envelope.	Valid
OMPS-Q2	Quarry	Creekline	419308	6591441	A potential quarry site consisting of two large hornfels boulders within the creekline that show evidence of being struck. No artefacts were recorded in the vicinity, however dense vegetation generally obscured visibility in this locale. The creekline is deeply incised and was flowing at the time of survey. It is situated within a very steep valley, with no terrace landform to speak of. It is possible that the boulders have been struck naturally by other rocks moving downstream in times of high energy flow. The site is located inside the current disturbance footprint.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-R1	Rockshelter	Steep slope	420649	6592257	Outcropping of large granodiorite boulders, providing a small overhang and a very small (100 cm (l) x 50 cm (w)) cave entrance, which extended back no more than a few meters. Identified by RAPs as potential shelter. The rockshelter was identified on an extremely steep slope and no artefacts or substantial soil profile, that might lend itself to archaeological deposit, was identified in this locale. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative
OMPS-R2	Rockshelter	Steep slope	420584	6592303	Outcropping of large granodiorite boulders, providing a very small (65 cm (l) x 100 cm (w)) cave entrance, which extended back no more than a few meters. No overhang was present. Identified by RAPs as potential shelter. The rockshelter was identified on an extremely steep slope and no artefacts were identified in association or nearby. At the opening, an animal den was observed to be dug out. The soils here appear to be a gravelly clay, suggesting a skeletal soil profile. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative
OMPS-SA1	Stone arrangement, artefact scatter	Spurcrest	419761	6593223	A potential stone arrangement identified on an outcrop of granodiorite identified by RAP participants, with an artefact scatter in proximity. The site is located on a level to gently inclined spurcrest adjacent to an access track, and the area within which cultural materials were identified is approximately 50 m (l) x 40 m (w). The stone arrangement comprises up to seven lines of small (generally <10 cm) rocks placed in wavy lines on outcropping granodiorite. The antiquity of this site is questionable, as the rocks within the stone arrangement are very small and not secured. Some of these lines are intact, though have been disturbed and retain no discernible form. RAP participants suggested the stone arrangement formed a marker, in line with a number of landmarks including the Carrai Waterholes (~7 km southeast). In addition, several artefacts were identified on the access track adjacent to the stone arrangement. Artefacts identified included a number of hornfels flakes and a blade, and a retouched silcrete flake. The site is located inside the current disturbance footprint.	Tentative
OMPS-SA2	Stone arrangement	Terrace	422127	6595413	A potential stone arrangement identified on an outcrop of granodiorite identified by RAP participants. The site is located on a level to gently inclined terrace abutting the Macleay River (~210 m west) and on the verge of the active flood zone, and the area within which cultural materials were identified is approximately 2.5 m (l) x 2 m (w). The stone arrangement comprises a number of small (generally <10 cm) rocks on the outcrop, though they form no discernible pattern or form. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-SA3	Stone arrangement	Ridge	424416	6600176	A potential stone arrangement identified by RAP participants, located on a small saddle along the ridgeline in the mountains to the north of the project area. The stone arrangement is very obscured by dense vegetation and features a few large slate boulders with no discernible form or pattern, measuring 105 cm (l) x 80 cm (w) and no more than 50 cm high. The site is located inside the current disturbance footprint.	Tentative
OMPS-SA4	Stone arrangement	Hillslope	421924	6591738	A potential stone arrangement identified on an outcrop of granodiorite identified by RAP participants. The site is located on a hillslope where the Carrai Plateau starts to drop away into the Macleay River Valley. The arrangement has not discernible shape or form, and features a few (<10) granodiorite rocks on exposed granodiorite bedrock. Identified by RAPs as potential stone arrangement due to the patterning, including one stone standing upright. The site is located inside the current disturbance footprint.	Tentative
OMPS-SA5	Stone arrangement	Ridge	421817	6592279	A potential stone arrangement identified on an outcrop of granodiorite identified by RAP participants. The site is located on a small saddle along the ridgeline in the mountains to the north of the project area. The arrangement has not discernible shape or form, and features a few (<5) granodiorite rocks on exposed granodiorite bedrock. It is very overgrown with long grasses. The site is located outside the construction envelope.	Tentative
OMPS-SA6	Stone arrangement	Spurcrest	421283	6591926	A potential stone arrangement identified on a spurcrest, where the Carrai Plateau drops away into the Macleay River Valley. The stone arrangement consists of a loosely arranged pile of rocks/cairn (approximately 60 cm (l) x 1.3 m (w)). The elevation of the site offers good views of the Macleay River valley, particularly when facing west. Discussion with RAP participants identified this as a potential stone arrangement, burial or European cairn. The site is located inside the current disturbance footprint. The site is located inside the current disturbance footprint.	Tentative
OMPS-ST01	Culturally modified tree	Spurcrest	422914	6596681	A potential culturally modified tree identified by RAP participants on a spurcrest >500 m east of the Macleay River. RAP participants noted that this tree was in line with OMPS-W1, a potential ring tree and fig tree (known to be women's trees) also identified by RAP participants. The scar was identified very low off the ground (~10cm), and the scar itself was long, narrow and jagged (56 cm (l)x 8 cm (w)). The scar exhibited signs of substantial regrowth but has been damaged by fire in the recent past. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-ST02	Culturally modified tree	Terrace	425584	6596994	A potential culturally modified tree identified on an alluvial terrace, ~230 m south of the Macleay River (outside flood zone). The tree features a single large scar (240 cm (l) x 35 cm (w) x 30-50 cm (d)) situated 30cm from the base of a very old river red gum (<i>Eucalyptus camaldulensis</i>). The scar exhibited considerable regrowth, and due to the size and proximity to water, may reflect a canoe scar. The tree is living; however, a parasitic climbing fig is present. The site is located outside the construction envelope.	Tentative
OMPS-ST03	Culturally modified tree	Terrace	429810	6599736	A potential culturally modified tree identified on an alluvial terrace, ~230 m west of the Macleay River. The scar is unusually high from the ground (~2.5 m) and the scar itself was 120 cm long; width could not be accurately measured due to the height of the scar. The tree is a very old, living river red gum (<i>Eucalyptus camaldulensis</i>), and very little regrowth was observed (suggesting a potentially recent, natural origin). The site is located outside the construction envelope.	Tentative
OMPS-ST04	Culturally modified tree	Terrace	432073	6597330	A potential culturally modified tree identified on an alluvial terrace, ~345 m west of the Macleay River. The tree features a single scar (120 cm (l) x 25 cm (w) x 6cm (d)) situated 1.5 m from the base of a very old, living river red gum (<i>Eucalyptus camaldulensis</i>) and the scar exhibits some regrowth. The site is located outside the construction envelope.	Tentative
OMPS-ST05	Culturally modified tree	Ridge	424358	6598253	A potential culturally modified tree identified on a ridgeline at the top of a very tall mountain range. The tree features a single very narrow and shallow scar (110 cm (l) x 10 cm (w) x 2 cm (d)) situated 80 cm from the base, facing north (upslope). The tree is a living blue gum, likely Maiden's gum (<i>Eucalyptus maidenii</i>), and very little regrowth was observed (suggesting a potentially recent, natural origin). The site is located outside the construction envelope.	Tentative
OMPS-ST06	Culturally modified tree	Ridge	424371	6598256	A potential culturally modified tree identified on a ridgeline at the top of a very tall mountain range. The tree features a single long but very narrow and shallow scar (200 cm (l) x 17 cm (w) x 2 cm (d)) situated 20 cm from the base, facing north (upslope). The tree is a living blue gum, likely Maiden's gum (<i>Eucalyptus maidenii</i>), and very little regrowth was observed (suggesting a potentially recent, natural origin). The site is located outside the construction envelope.	Tentative
OMPS-ST07	Culturally modified tree	Ridge	424365	6598231	A potential culturally modified tree identified on a ridgeline at the top of a very tall mountain range. The tree features two irregular oval scars, both measuring approximately 50 cm (l) x 20 cm (w) x 3 cm (d), with one facing west and one facing east. The scars are unusually high from the ground (~2.5m) and the tree is a living blue gum, likely Maiden's gum (<i>Eucalyptus maidenii</i>), and considerable regrowth was observed. The site is located outside the construction envelope.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-ST08	Culturally modified tree	Ridge	424477	6598262	A potential culturally modified tree identified on a ridgeline at the top of a very tall mountain range. The tree features a single long triangular scar (300 cm (l) x 60 cm (w) x 3 cm (d)) that extends all the way to the base of a living, mature <i>Eucalyptus sp.</i> tree, north facing. Very little regrowth was observed, suggesting a potentially recent, natural origin, likely limb tear or natural shedding over outer bark. The site is located outside the construction envelope.	Tentative
OMPS-ST09	Culturally modified tree	Spurslope	426058	6601073	A potential culturally modified tree identified on a very steep spurslope near the top of a very tall mountain range. The tree features a single elongated but irregular scar (120 cm (l) x 20 cm (w) x 4 cm (d)) situated 15cm from the base of a living blue gum, likely Maiden's gum (<i>Eucalyptus maidenii</i>). The scar is south facing. Some regrowth was observed, though the tree has been damaged by recent bushfire activity. The site is located outside the construction envelope.	Tentative
OMPS-ST10	Culturally modified tree	Ridge	426198	6600873	A potential culturally modified tree identified by RAP participants on an access track that runs along and adjacent to the ridgeline of the mountains. The tree was identified in the road verge. The tree features an elongated, irregular scar on a living, mature <i>Eucalyptus sp.</i> tree. The scar exhibited considerable regrowth, and vegetation debris around the tree suggest this scar may be the result of natural limb tear. located inside the current disturbance footprint.	Tentative
OMPS-ST11	Culturally modified tree, artefact scatter	Hillslope	422232	6597573	A potential culturally modified tree identified on the alluvial flats ~60 m southwest of Georges Creek. The tree is a very old, living river red gum (<i>Eucalyptus camaldulensis</i>), and features a single round scar at the base of the tree. Regrowth has obscured the bottom of the scar. Two artefacts, hornfels river cobbles with evidence of flaking, were identified in proximity. The landscape here is generally flat but has been deeply incised by hydrology changes over time, and parts of the landscape to the southwest have been cut in to allow for an access track. Visibility is poor with thick grass cover and little exposures outside the access track. The site is located outside the construction envelope.	Tentative
OMPS-ST12	Culturally modified tree	Terrace	422267	6597763	A potential culturally modified tree identified on the on the alluvial flats ~60 m northeast of Georges Creek. The tree is stringy bark (species unknown, probably brown stringy bark, <i>Eucalyptus baxteri</i>). The tree features a single inverted teardrop scar measuring (100 cm (l) x 25 cm (w) x 15 cm (d)) situated 1.1 m from the base. No cambium remains. The site is located outside the construction envelope.	Tentative

Table F.2 **Aboriginal sites identified during the field survey**

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-ST13	Culturally modified tree	Terrace	422525	6597725	A potential culturally modified tree identified on the deeply incised alluvial bank of Georges Creek, ~60 m northeast of the creek itself. The tree features a single elongated oval scar (230 cm (l) x 50 cm (w) x 10 cm (d)) situated 1.5 cm from the base of an old river red gum (<i>Eucalyptus camaldulensis</i>). The scar exhibited considerable regrowth (>100 mm), and due to the size and proximity to water, may reflect a canoe scar. The site is located outside the construction envelope.	Tentative
OMPS-ST14	Culturally modified tree	Hillslope	422420	6597658	A potential culturally modified tree identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~100 m northeast of the creek itself. The tree is located on the northern road verge of the Kempsey-Armidale Road, near Georges Junction. The tree features an elongated oval scar on an old river red gum (<i>Eucalyptus camaldulensis</i>), with the scar facing southwest. The site is located outside the construction envelope.	Tentative
OMPS-ST15	Culturally modified tree	Hillslope	422382	6597653	A potential culturally modified tree identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~80 m northeast of the creek itself. The tree is located on the southern road verge of the Kempsey-Armidale Road, near Georges Junction. The tree features a two oval scars, both measuring approximately 30 cm (l) x 8 cm (w) x 2 cm (d) situated 1m from the base of a young river red gum (<i>Eucalyptus camaldulensis</i>). The lower scar has been used as a corner post for fencing with two steel nails with circular hooks driven into the cambium. Observations made at the time of survey (eg age of tree, steel cut marks, etc.) suggested these scar may be recent (ie post contact or contemporary) and is also in proximity to OMPS-ST16 and OMPS-ST17, which exhibit similar features. The site is located outside the construction envelope.	Tentative
OMPS-ST16	Culturally modified tree	Hillslope	422374	6597625	A potential culturally modified tree identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~65 m northeast of the creek itself. The tree is located on the southern road verge of the Kempsey-Armidale Road, near Georges Junction. The tree features a single oval scar (40 cm (l) x 10 cm (w) x 2 cm (d)) situated 90 m from the base of a young river red gum (<i>Eucalyptus camaldulensis</i>). Observations made at the time of survey (eg age of tree, steel cut marks, etc.) suggested these scar may be recent (ie post contact or contemporary) and is also in proximity to OMPS-ST15 and OMPS-ST17, which exhibit similar features. The site is located outside the construction envelope.	Tentative

Table F.2 Aboriginal sites identified during the field survey

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-ST17	Culturally modified tree	Hillslope	422379	6597620	A potential culturally modified tree identified on the lower slopes adjacent to the Georges Creek alluvial terrace, ~65 m northeast of the creek itself. The tree is located on the southern road verge of the Kempsey-Armidale Road, near Georges Junction. The tree features a single oval scar (50 cm (l) x 15 cm (w) x 2 cm (d)) situated ~1 m from the base of a young river red gum (<i>Eucalyptus camaldulensis</i>). Observations made at the time of survey (eg age of tree, steel cut marks, etc.) suggested these scar may be recent (ie post contact or contemporary) and is also in proximity to OMPS-ST15 and OMPS-ST16, which exhibit similar features. The site is located outside the construction envelope.	Tentative
OMPS-ST18	Culturally modified tree	Terrace	422400	6597603	A potential culturally modified tree identified on an alluvial terrace, ~50 m northeast of Georges Creek near Georges Junction where the creek meets the Macleay River. The tree features two oval scars; the larger scar measures 110 cm (l) x 20 cm (w) x 25 cm (d); and the smaller scar measures 40 cm (l) x 10 cm (w) x 5 cm (d). The smaller scar is lower, and measures 80cm from the base of the tree. The tree itself is an old river red gum (<i>Eucalyptus camaldulensis</i>). Observations made at the time of survey (eg age of tree, steel cut marks, etc.) suggests the smaller scar may be recent (ie post contact or contemporary) and is also in proximity to OMPS-ST1, OMPS-ST16, and OMPS-17 which exhibit similar features. The site is located outside the construction envelope.	Tentative
OMPS-ST19	Culturally modified tree	Plateau	422805	6591722	A potential culturally modified tree identified by RAP participants on the relatively flat to gently undulating plateau of the Carrai Plateau. No watercourses are in the vicinity. The tree features a single small scar situated low, near the base of a young <i>Eucalyptus sp.</i> tree. The tree is damaged from bushfire, and the dry face is burnt out. The site is located inside the current disturbance footprint.	Tentative
OMPS-ST20	Culturally modified tree	Plateau	421992	6591097	A potential culturally modified tree identified on the relatively flat to gently undulating plateau of the Carrai Plateau. The site is located near the headwaters of a first order waterway, ~100m west. The tree features three scars, measuring 160 cm (l) x 10 cm (w), 180 cm (l) x 20 cm (w), and 45 cm (l) x 15 cm (w). The smallest scar is unusually close to the base and may be the result of tearing. The tree, a mature <i>Eucalyptus sp.</i> , has been damaged by bushfires and all scars have been burnt. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative

Table F.2 **Aboriginal sites identified during the field survey**

Site ID	Site type	Landform	Easting	Northing	Description	Site status
OMPS-ST21	Culturally modified tree	Plateau	421523	6591502	A potential culturally modified tree identified on the relatively flat to gently undulating plateau of the Carrai Plateau. The tree features a single irregular shaped scar. The scar exhibited considerable regrowth and is significantly warped. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative
OMPS-ST22	Culturally modified tree	Hillslope	421979	6591569	A potential culturally modified tree identified on the steep slope where the Carrai Plateau starts to drop away into the Macleay River Valley. The tree is set amongst a rock outcropping of massive granodiorite boulders. The tree, species unknown, features one scar measuring 200 cm (l) x 25 cm (w), and features significant regrowth (90 cm). The tree is ancient and one of the largest in the area. The site is located inside the construction envelope, but outside the current disturbance footprint.	Tentative
OMPS-ST23	Culturally modified tree	Hillslope	421953	6592257	A potential culturally modified tree identified by RAP participants on the steep slope where the Carrai Plateau starts to drop away into the Macleay River Valley. The tree features a single large scar starting 3 m above ground, though right lateral margin is highly obscure, and the actual scar length is ~3 m. Very little regrowth was observed, suggesting a potentially recent, natural origin, likely limb tear. The site is located outside the construction envelope.	Tentative
OMPS-ST24	Culturally modified tree, potential women's site	Hillslope	422761	6596985	Potential women's tree (native fig tree) identified by Lila Quinlan (Thunggutti LALC), located by creekline on steep slope with granodiorite outcropping. Lila noted that women's trees required an area that provided protection from the elements and sharp rocks nearby to cut umbilical cords. Placenta was buried under fruit trees to nourish them. The site is located outside the construction envelope.	Tentative

F.3 Photograph catalogue (field survey)

Site ID: 100822-HS01



Detail

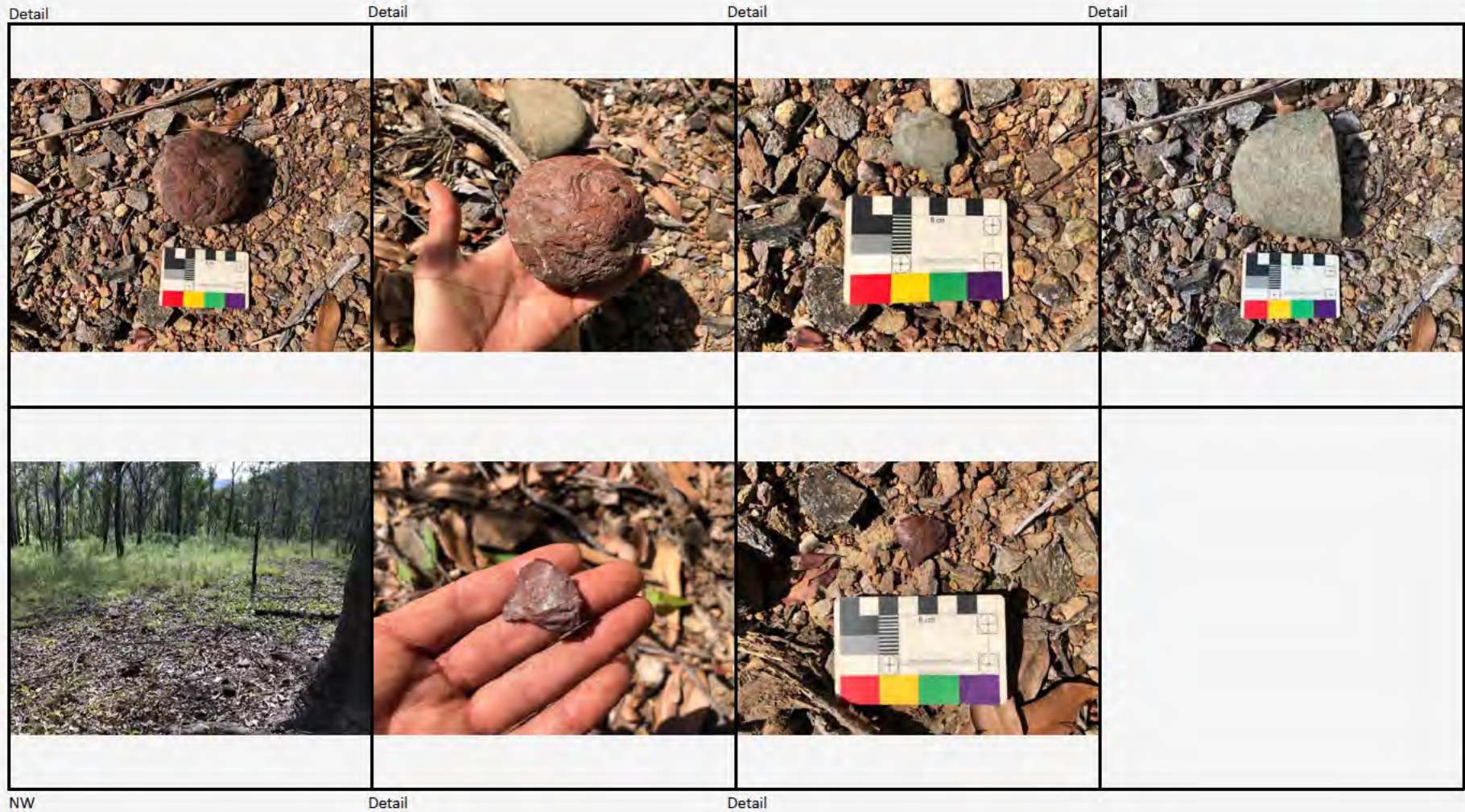


Detail



West





Site ID: AHIMS 21-5-0143



Detail



Detail



Detail







North



Site ID: AHIMS 21-5-0143



Detail	Detail	Detail	North west
 A close-up photograph of a person's hand holding a dark, irregularly shaped rock. The background shows a rocky, uneven ground surface.	 A photograph of a dark rock resting on a dirt and leaf-covered ground. A color calibration scale bar is placed below the rock for size reference.	 A photograph of a dark rock resting on a dirt and leaf-covered ground, similar to the previous image. A color calibration scale bar is placed below the rock for size reference.	 A photograph showing a dirt path or clearing in a wooded area, looking towards the northwest. The ground is covered with dry leaves and twigs.

Site ID: AHIMS 21-5-0143



Detail



Detail



Detail



North west



Site ID: AHIMS 21-5-0143



Detail



Detail



Detail



South



Site ID: AHIMS 21-5-0143



Detail



Detail



East



South east



Site ID: AHIMS 21-5-0143



Detail



Detail



North west



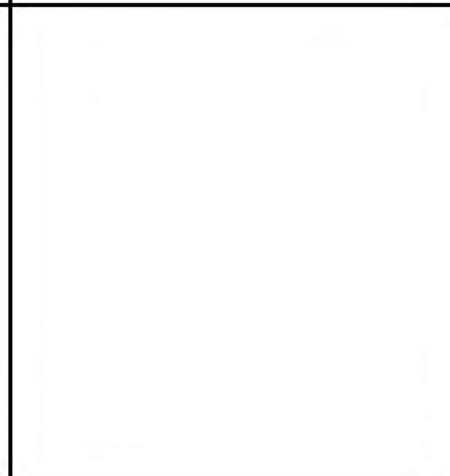
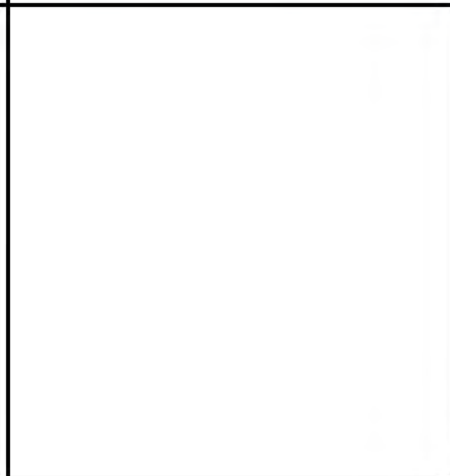
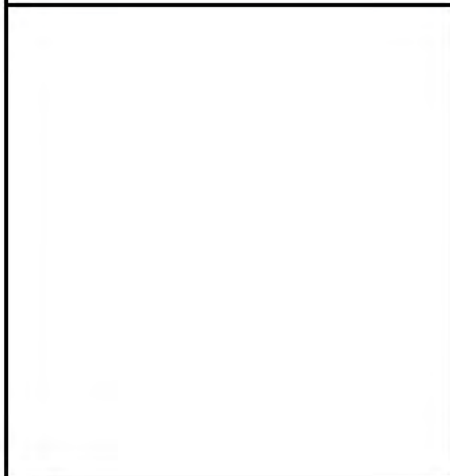
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Detail

Detail

North west



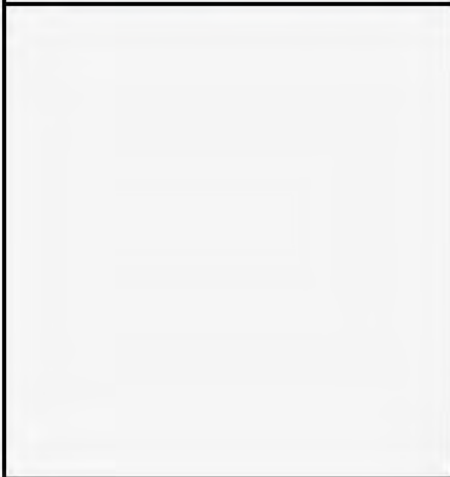
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Detail

Detail

South



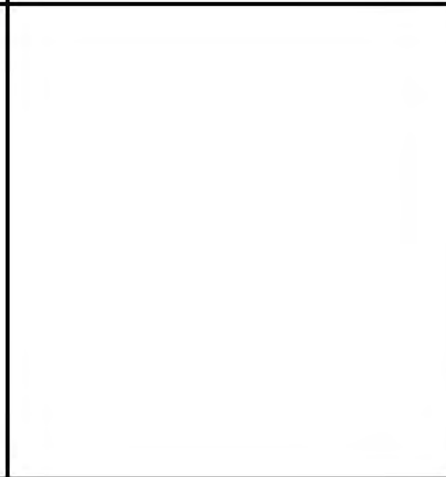
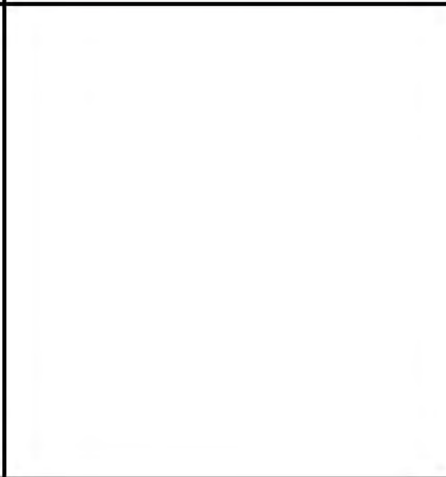
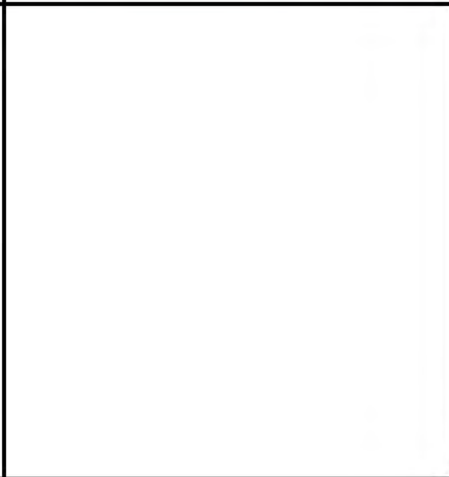
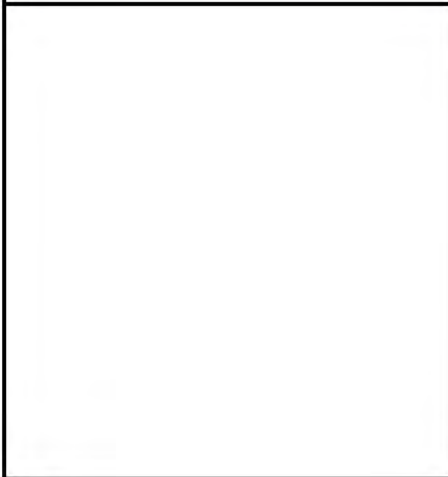
Site ID: AHIMS 21-5-0143



Detail

Detail

West



Site ID: AHIMS 21-5-0143



Detail

Detail

West



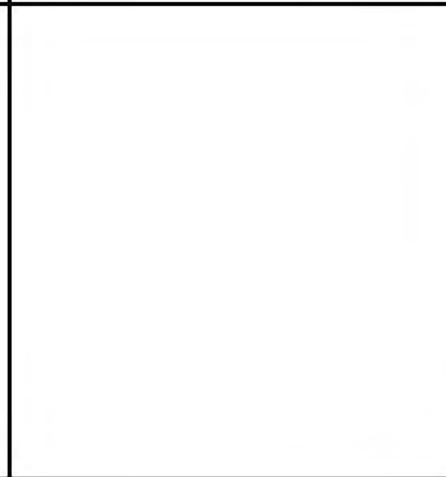
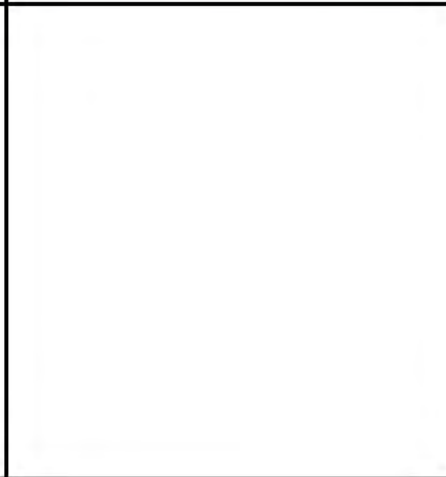
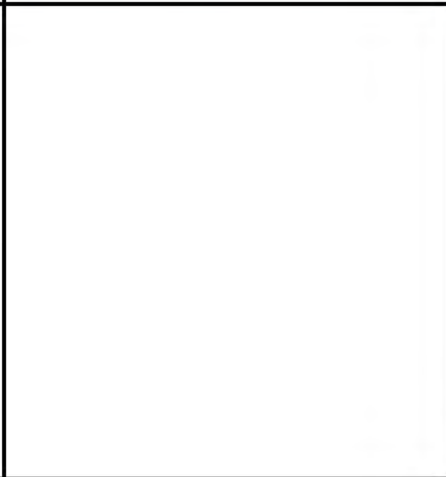
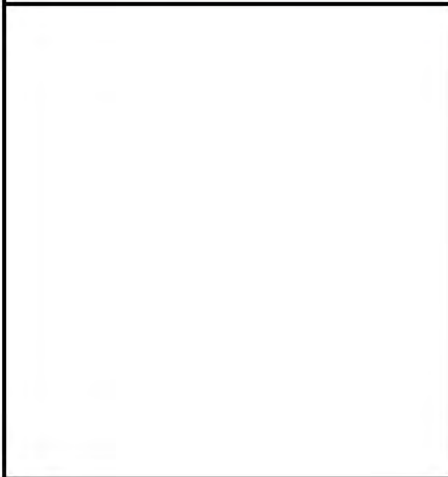
Site ID: AHIMS 21-5-0143



Detail

Detail

West



Site ID: AHIMS 21-5-0143



Detail

Detail

West



Site ID: AHIMS 21-5-0143



Detail

West

North

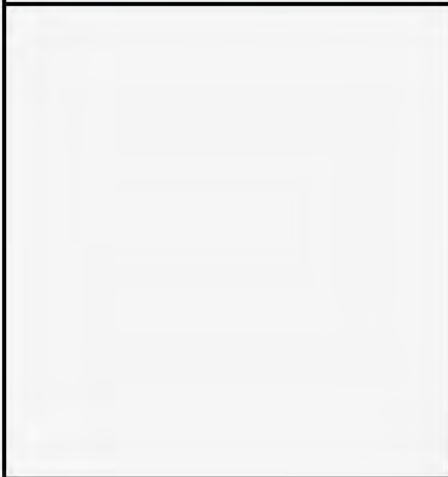
 A close-up photograph of a large, dark grey, angular rock resting on a bed of green grass and brown leaves. A small, white color calibration chart with various colored squares is placed in the foreground for scale.	 A photograph showing a view of a wooded area looking west. The foreground is a grassy slope, and the background is filled with tall, thin trees under a bright sky.	 A photograph showing a view of a wooded area looking north. The foreground is a grassy slope, and the background shows a line of trees and a glimpse of a blue sky with clouds.	

Site ID: AHIMS 21-5-0143



West

South west

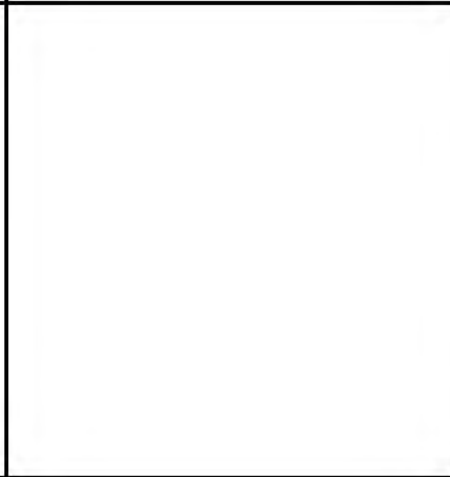
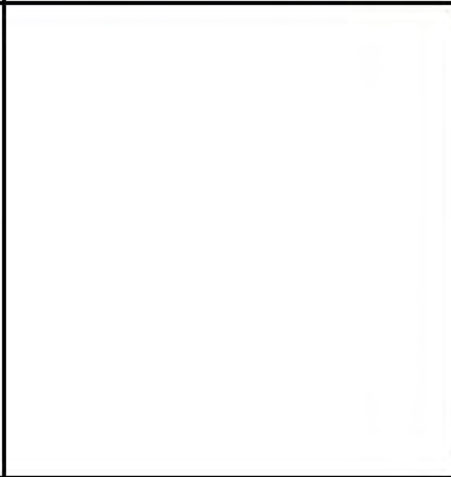
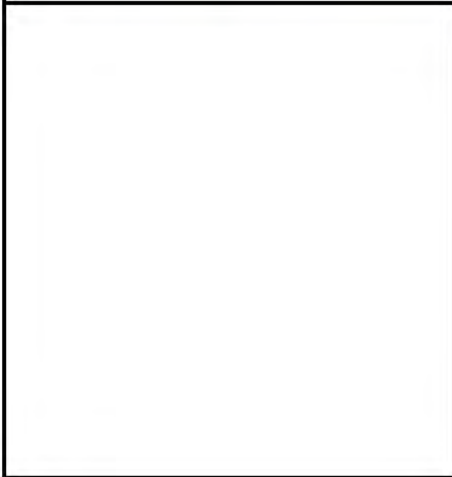


Site ID: NOT A SITE



Detail

East



Site ID: OMPS-AS1



Basalt core

Basalt core

Silcrete





East



South

Site ID: OMPS-AS1



Detail	Detail	Possible grind stone	East
			

Detail



Detail



Detail



Detail



West

Site ID: OMPS-AS11



Detail



Detail



West



Site ID: OMPS-AS11

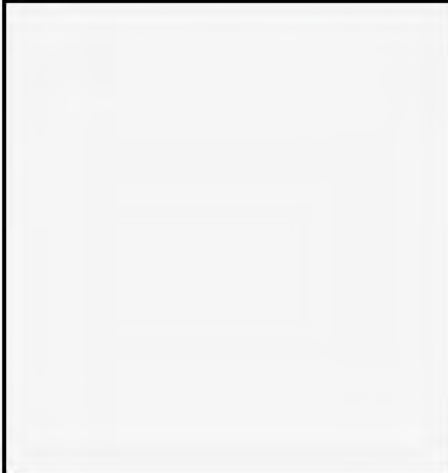


Lomandra

Detail

Detail

West



Detail



Detail



West



Detail



Detail

North west

Detail



Detail



Detail



East



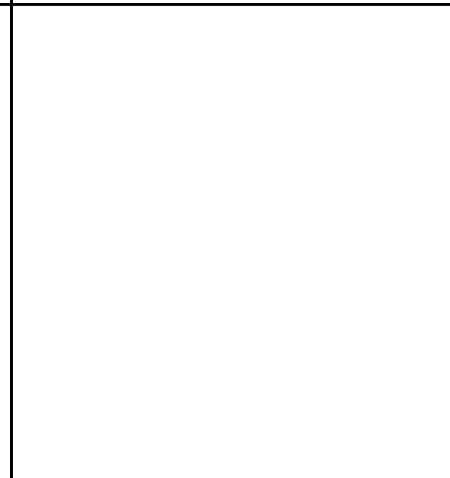
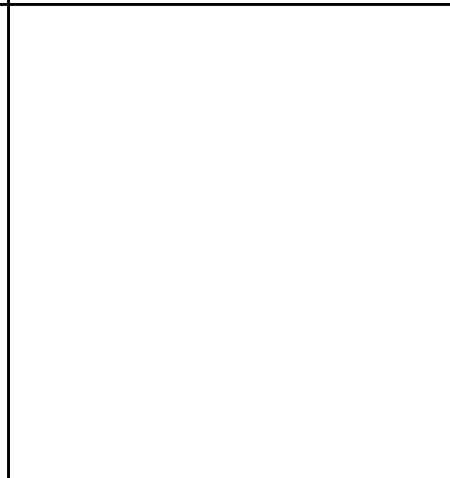
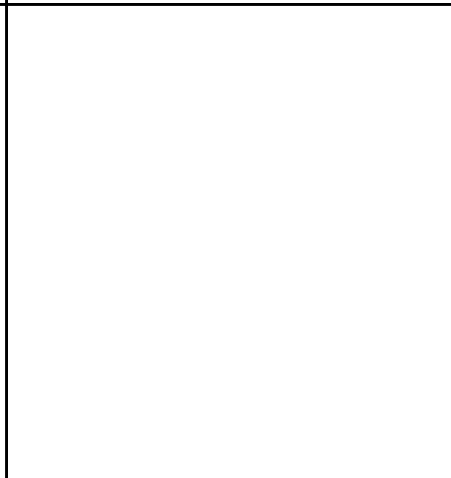
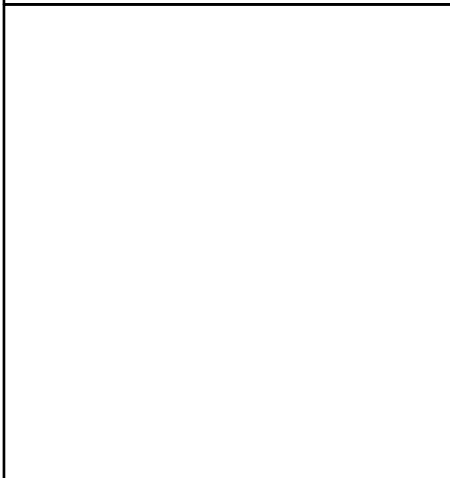
Site ID: OMPS-AS14



Detail

Detail

North



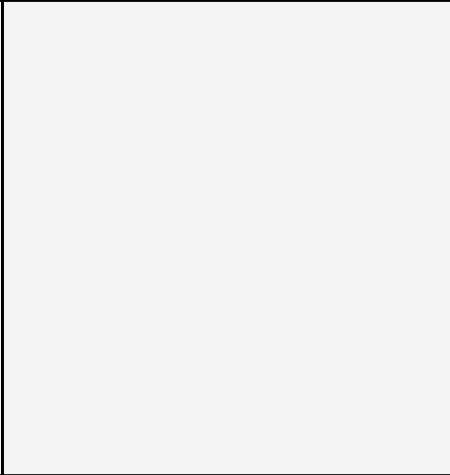
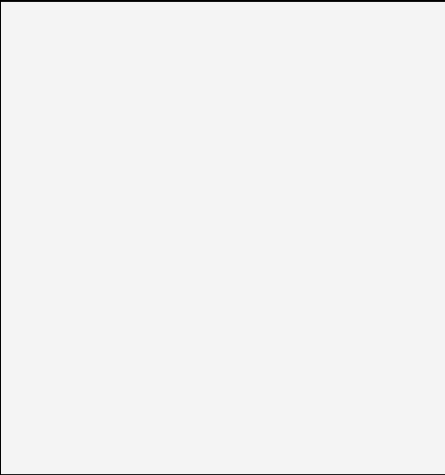
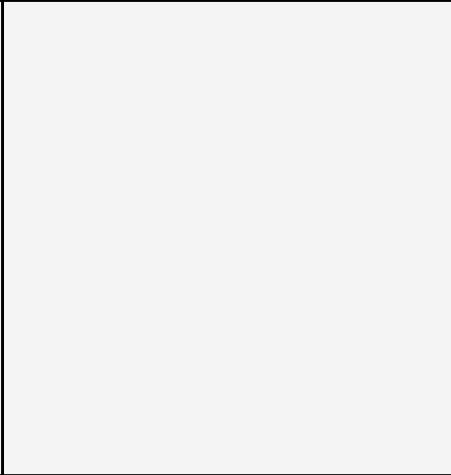
Site ID: OMPS-AS14



Detail

Detail

North



Detail

East

Detail

North



Detail

Detail

North

Dorsal surface

Ventral surface

South



Site ID: OMPS-AS16

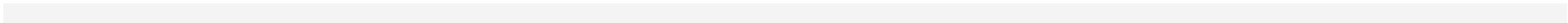


Dorsal surface




Ventral surface

West



Site ID: OMPS-AS16




Dorsal surface	Ventral surface	East	
			

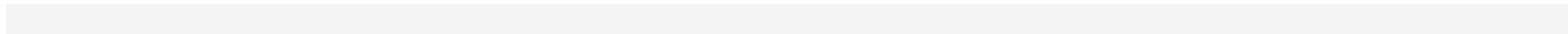
Site ID: OMPS-AS16

Ventral surface

Dorsal surface




West



Site ID: OMPS-AS16



Ventral surface	Dorsal surface	East	
			

Basalt axe	Basalt axe	Basalt flake 1	Basalt flake 1
			
			
Basalt flake 2	Basalt flake 2	South	West

Basalt axehead	Basalt axehead	Basalt flake	Basalt flake
			
			
Basalt flake 2	Basalt flake 3	Quartz flakes	West

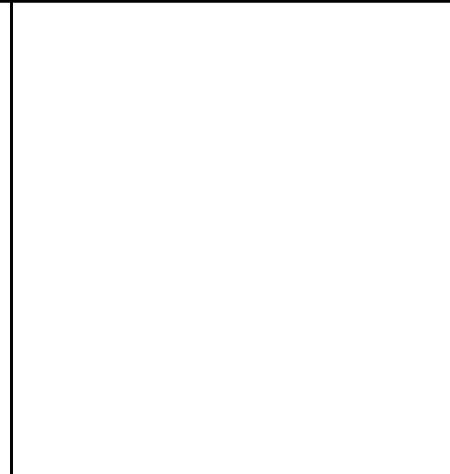
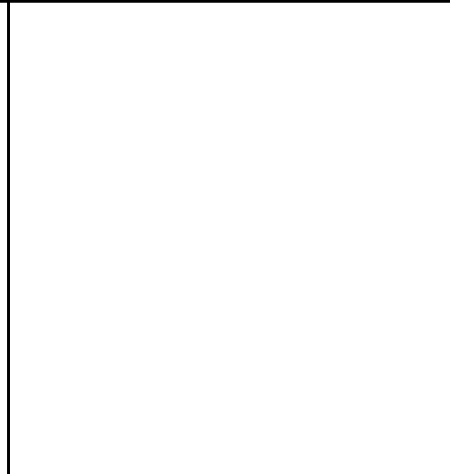
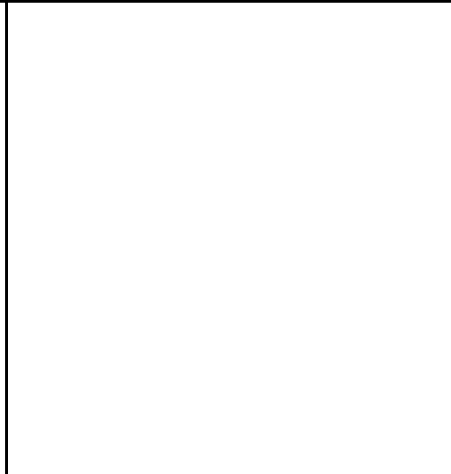
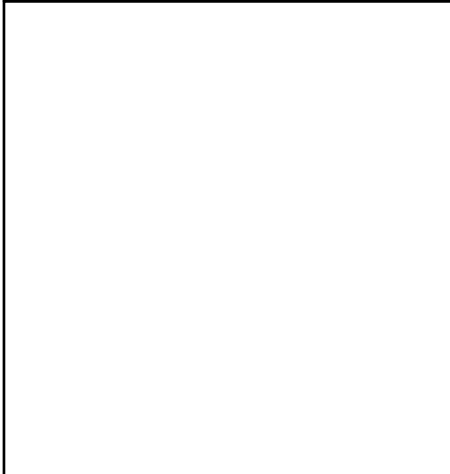
Site ID: OMPS-AS17



Detail

Detail

North east



Detail



Detail



Detail








Detail



North west

Site ID: OMPS-AS18



Detail	Detail	North	Detail
			
			

South



Site ID: OMPS-AS18



Detail

Detail

South



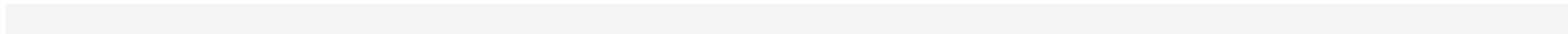
Site ID: OMPS-AS18



Detail

Detail

South



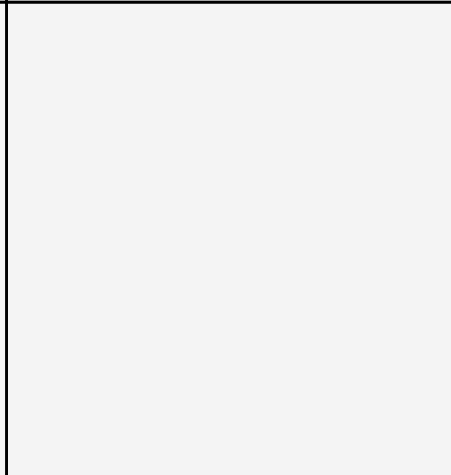
Site ID: OMPS-AS18



Detail

Detail

West



Site ID: OMPS-AS18

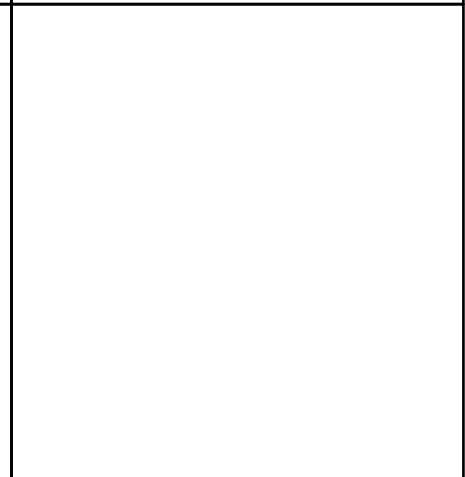
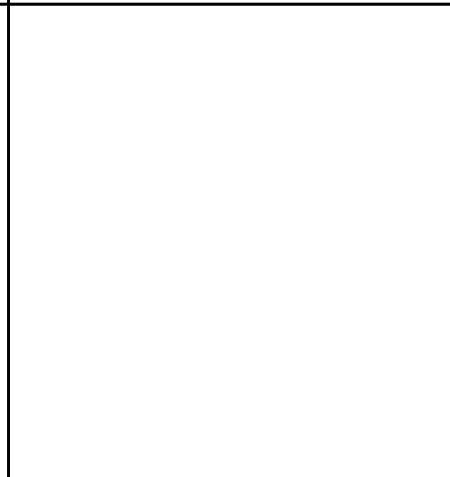
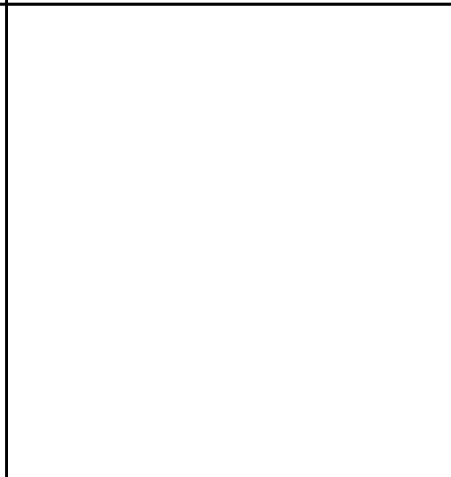
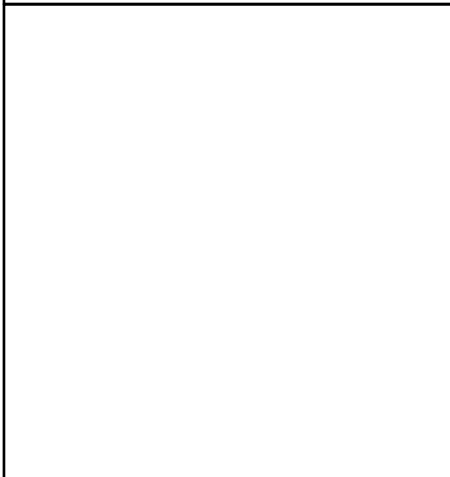


Detail

Detail

West

North



Detail	North	Jasper	West
Detail	West		

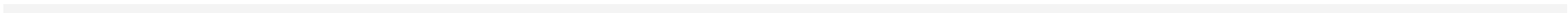
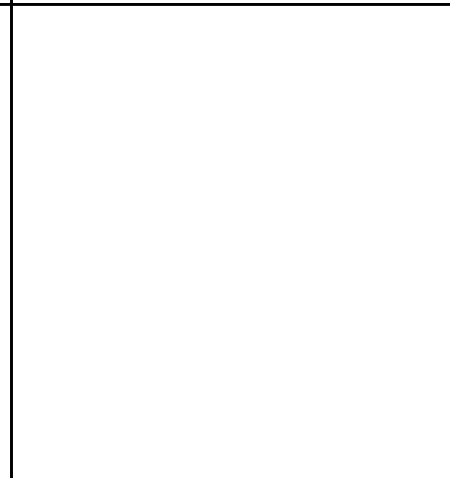
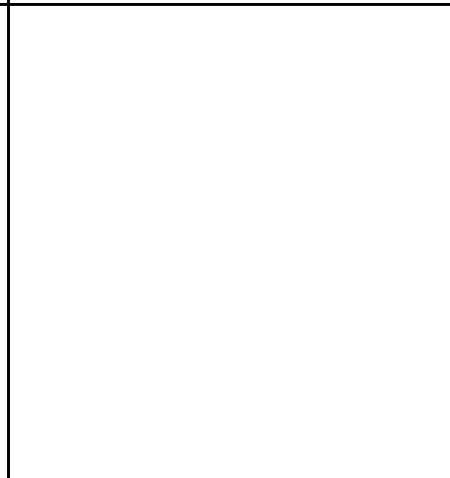
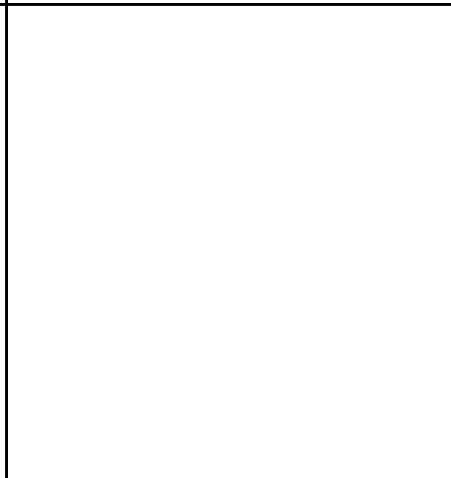
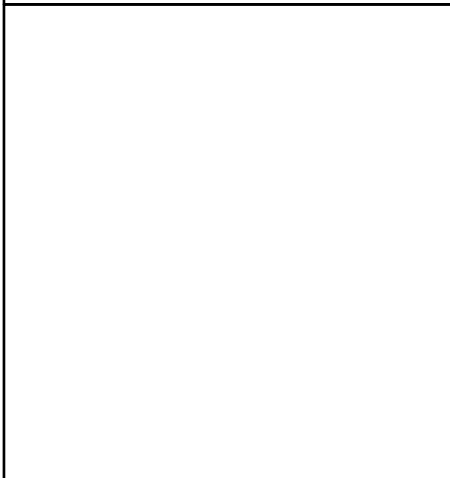
Site ID: OMPS-AS2



Detail

Detail

North west



Site ID: OMPS-AS2

Detail

North west





Site ID: OMPS-AS2



Dorsal surface

Ventral surface

North

 A photograph showing the dorsal surface of a dark, rounded rock. A red and white striped scale bar is placed vertically to the left of the rock for scale. The rock is situated on a ground covered with dry grass and some green plants.	 A photograph showing the ventral surface of the same dark, rounded rock. A red and white striped scale bar is placed horizontally above the rock. The rock is surrounded by dry grass and some green plants.	 A photograph showing the rock in its natural environment, viewed from the north. The rock is in the foreground, and the background shows a wooded area with several trees and a grassy clearing.	



Site ID: OMPS-AS21

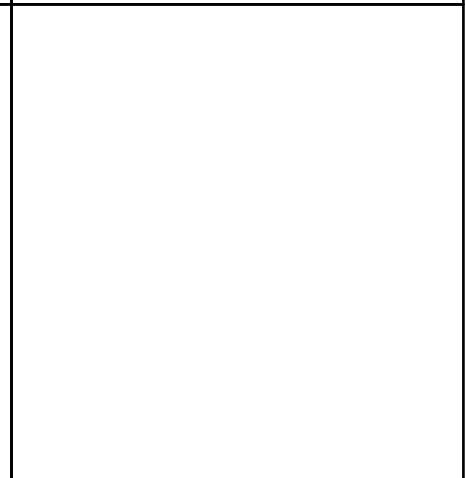
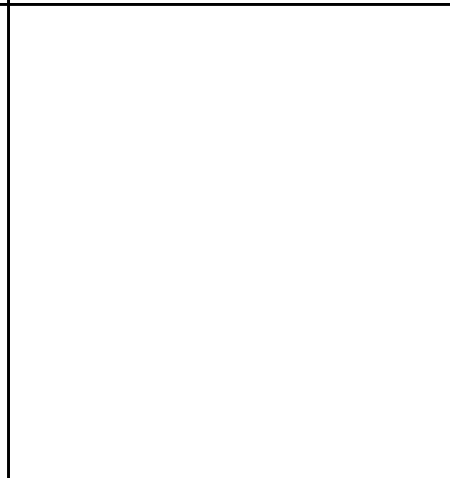
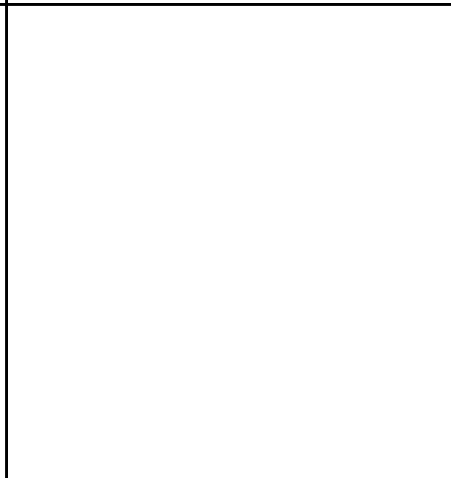
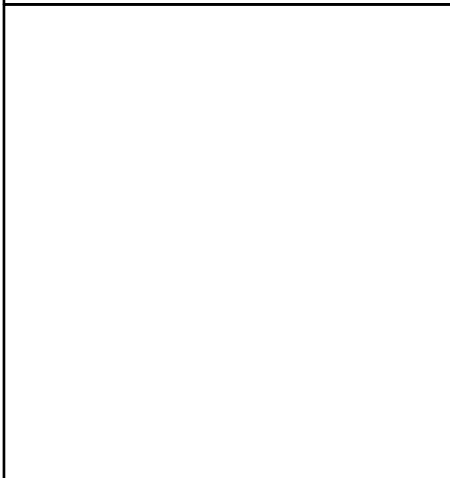


Detail

Detail

Detail

North

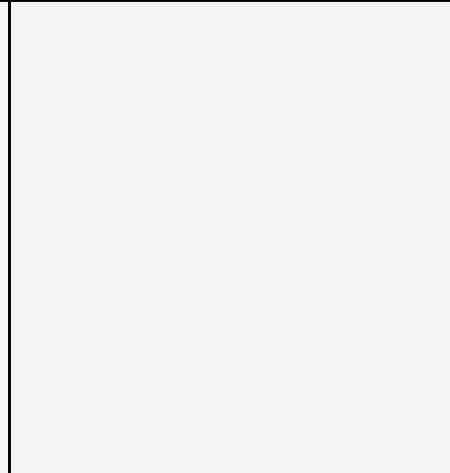
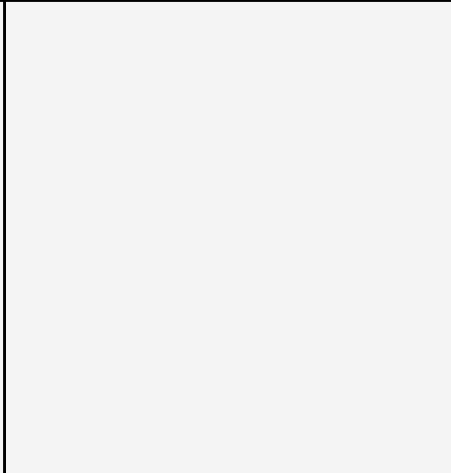


Site ID: OMPS-AS21



Detail

West






Site ID: OMPS-AS22

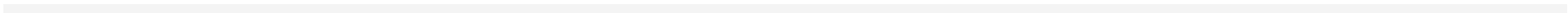


Detail

Detail

North



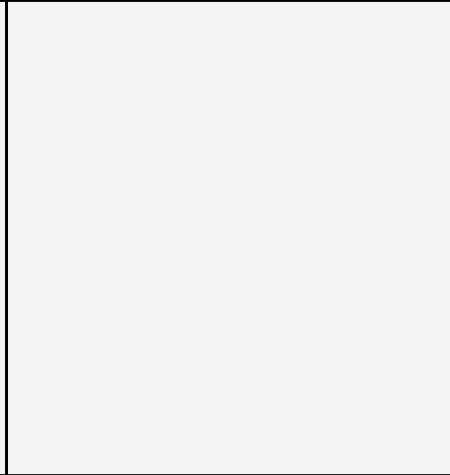
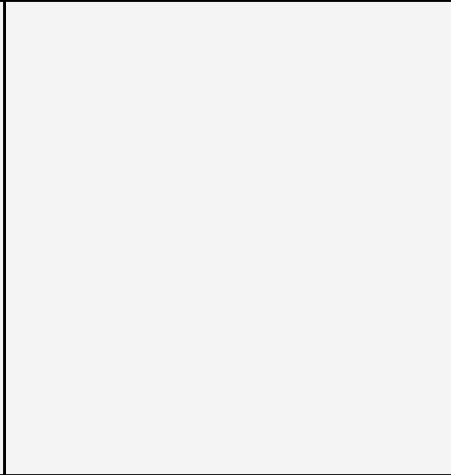
Site ID: OMPS-AS22



Detail

Detail

West






Site ID: OMPS-AS22



Dorsal surface

Ventral surface

East

 A photograph showing the dorsal surface of a smooth, greyish rock. A red and white striped ruler is placed horizontally below the rock for scale. The rock is surrounded by dry leaves and twigs.	 A photograph showing the ventral surface of the same rock. A red and white striped ruler is placed horizontally above the rock for scale. The rock is surrounded by dry leaves and twigs.	 A photograph showing the rock in its natural environment, surrounded by trees and green foliage. The rock is positioned in the foreground, and the background shows a dense wooded area.	

Site ID: OMPS-AS23



Detail

Detail

East



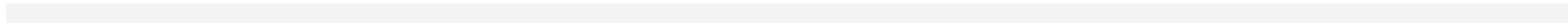
Site ID: OMPS-AS23



Detail




Detail

East



Site ID: OMPS-AS23



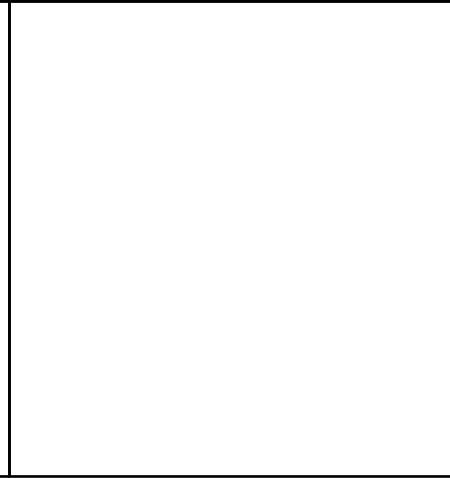
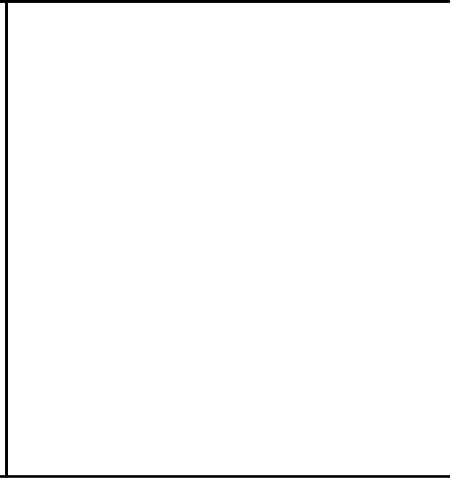
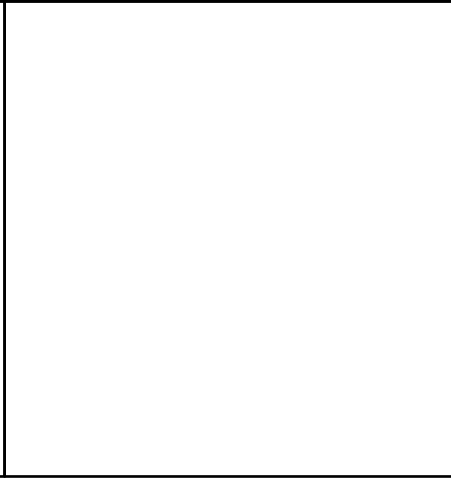
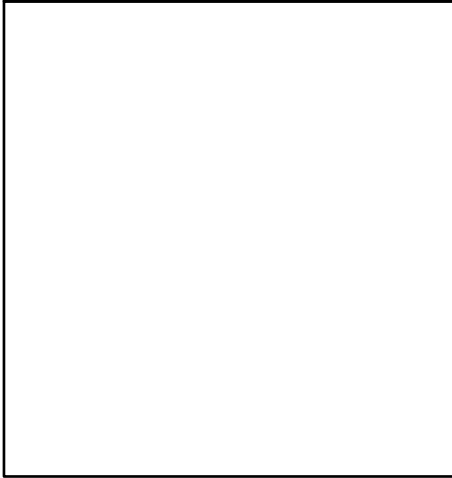
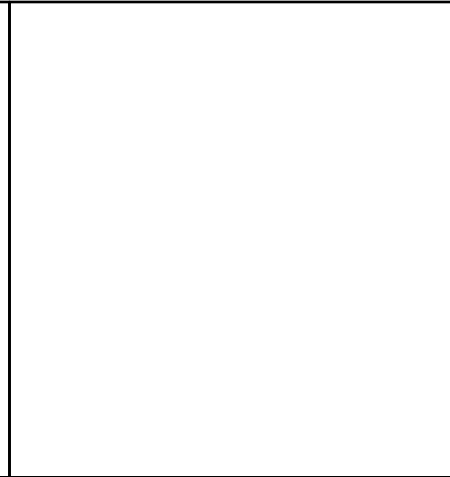
Detail	Detail	North	
 A close-up photograph of a person's hand holding a large, irregularly shaped rock. The rock is light brown and tan with some darker spots. The background is a ground covered in dry leaves and twigs.	 A close-up photograph of a person's hand holding the same rock from a different angle. The rock's surface appears more rounded and textured. The background is the same ground with dry leaves.	 A photograph of a dirt path leading through a forest. The path is covered in dry leaves and twigs. The trees are tall and thin, with some green foliage visible in the distance.	

Site ID: OMPS-AS24



Detail

North



Site ID: OMPS-AS24



Ventral surface

Dorsal surface

West






Site ID: OMPS-AS25



Anvil top

Anvil underside

North

 A photograph showing the top surface of a dark, rounded rock (anvil) lying on a bed of dry, brown leaves. A red and white striped surveying tape is placed horizontally above the rock for scale. The tape has the text "OMPS-AS25" and "EMM" printed on it.	 A photograph showing the underside of the same dark, rounded rock, also lying on dry leaves. A red and white striped surveying tape is placed horizontally above the rock for scale, with the text "OMPS-AS25" and "EMM" visible.	 A photograph showing a landscape view towards the north. The foreground is covered in dry leaves and twigs. In the background, there are several trees and a line of hills under a clear sky.	

Site ID: OMPS-AS25



Detail

Detail

North



Site ID: OMPS-AS25



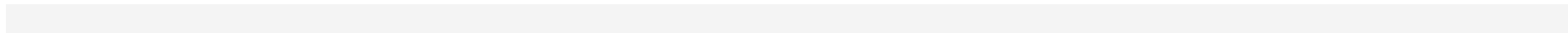
Detail



Detail



West

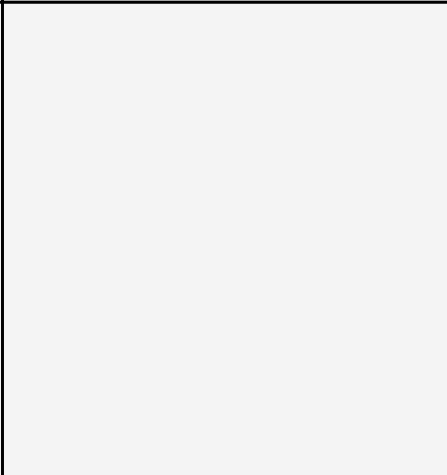
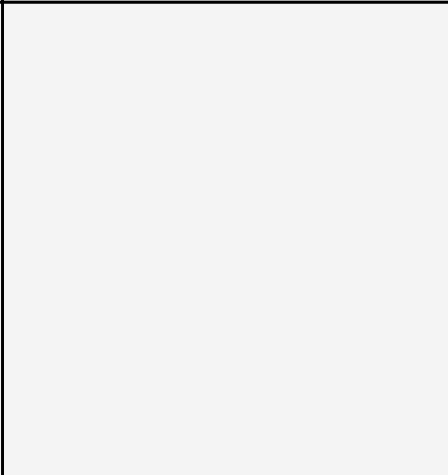
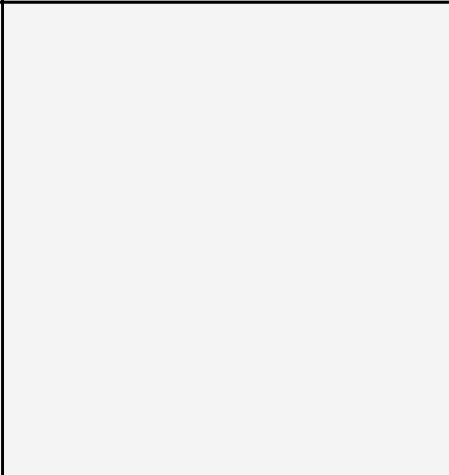


Site ID: OMPS-AS25



Detail

East





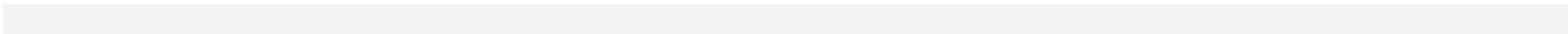
Site ID: OMPS-AS25



Detail

West

 A close-up photograph of a person's hand holding a dark, smooth, rounded rock. The background shows some dry leaves and vegetation.	 A photograph of a dirt path or clearing in a forest. The path is covered with dry leaves and some green plants. Tall trees are visible in the background.		



Site ID: OMPS-AS25



Platform of core

Detail

North



Site ID: OMPS-AS25




Ventral surface

Dorsal surface

West



Chert flake	Chert flake	Basalt axehead	Basalt axehead
			
			
Anvil	Chert flake	Chert flake	Hammerstone

Site ID: OMPS-AS27



Detail



Detail



North



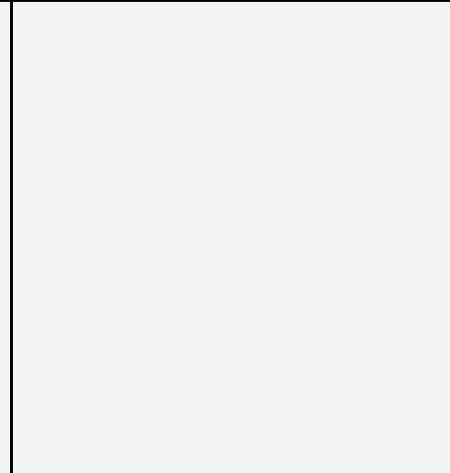
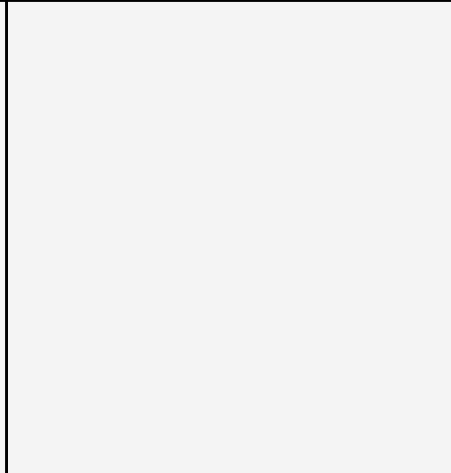
Site ID: OMPS-AS27



Detail

Detail

North



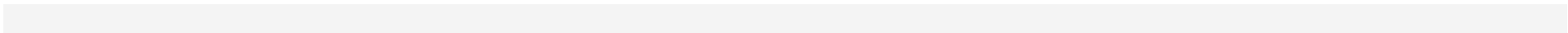
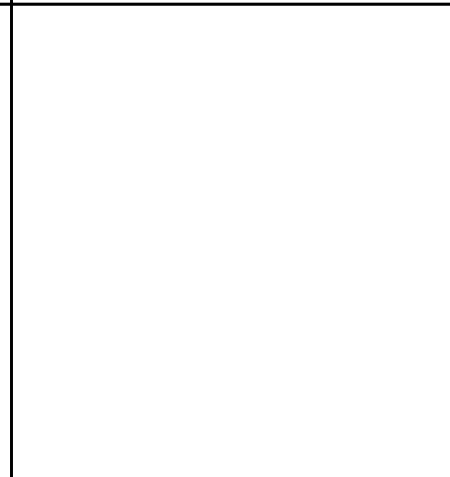
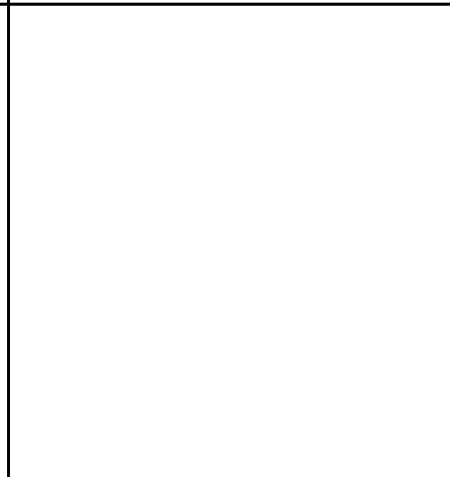
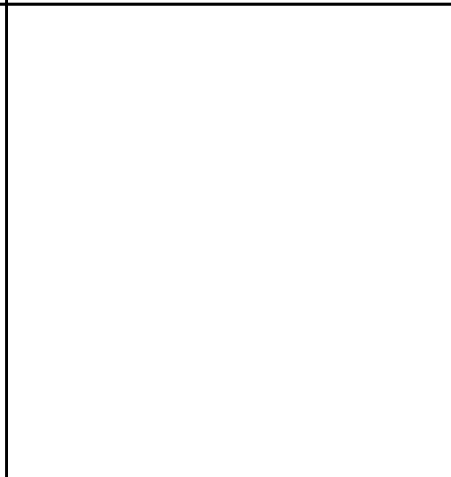
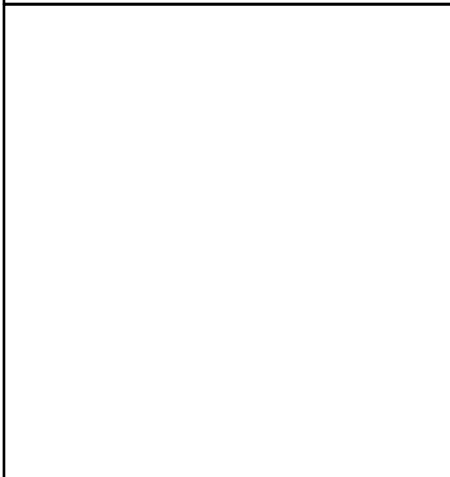
Site ID: OMPS-AS27







Detail

Detail

North



Detail	Detail	West	Detail
			




Site ID: OMPS-AS27



Dorsal surface




Ventral surface

West

 A photograph showing the dorsal surface of a light-colored, irregularly shaped stone artifact. The artifact is set against a background of brown soil and small rocks. A red and white striped surveying tape is placed horizontally above the artifact for scale. The tape has the text "DOR-MIN" and "DOR-MIN" printed on it.	 A photograph showing the ventral surface of the same stone artifact. The surface appears smoother and more uniform in color than the dorsal side. The same red and white striped surveying tape is placed horizontally above the artifact for scale.	 A photograph showing a wide view of the site. In the foreground, there is a large, light-colored tree trunk. In the background, a person wearing an orange vest is walking on a dirt path. The landscape is open with scattered trees and hills in the distance under a clear sky.	

Site ID: OMPS-AS27






Dorsal surface	Ventral surface	West	
 A close-up photograph of a white and red striped measuring rod (labeled "MINI-ROD") placed horizontally on a dark, rocky, and soil-covered ground surface. A small, light-colored, irregularly shaped object is visible above the rod.	 A close-up photograph of the same measuring rod and ground surface as in the dorsal view, but from the opposite side. The light-colored object is now visible below the rod.	 A photograph showing a person in a bright green safety vest and dark pants walking on a dirt path in a grassy field with trees in the background.	

Site ID: OMPS-AS27

Dorsal surface

Ventral surface

West

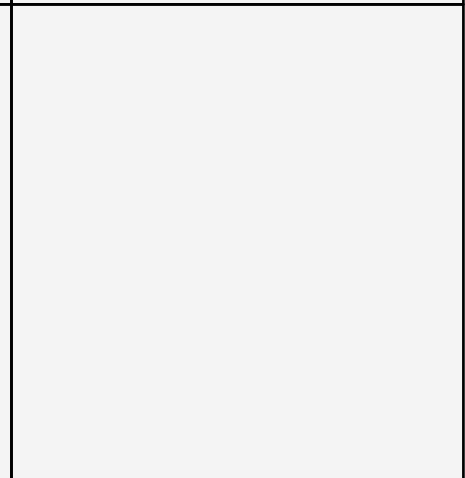
			

Detail

Detail

East

North



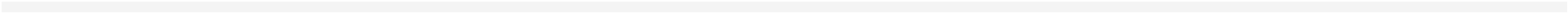
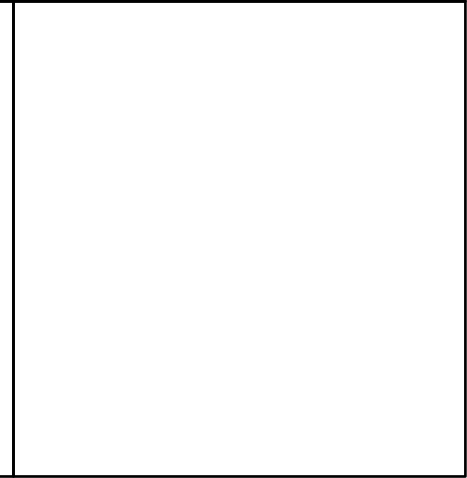
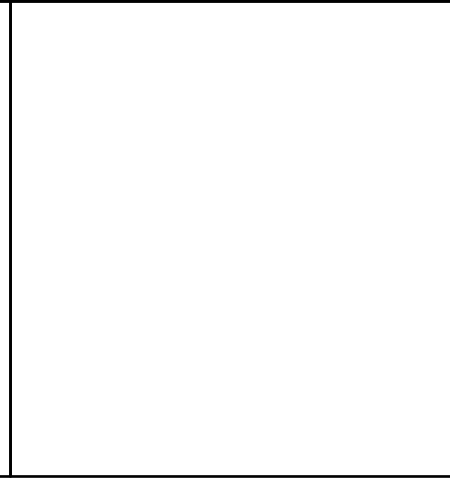
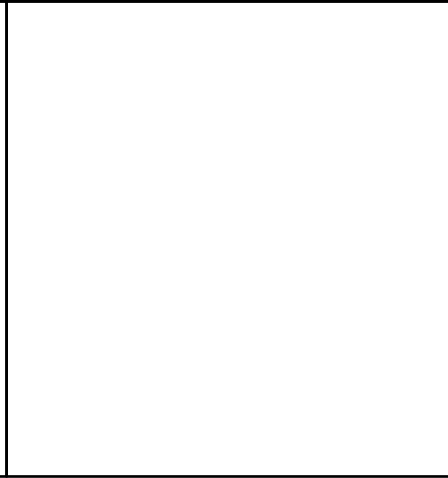
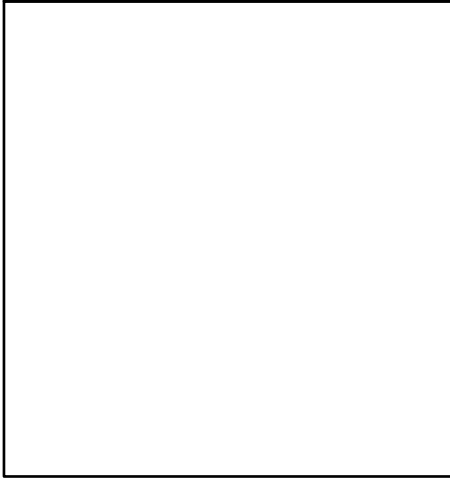
Site ID: OMPS-AS29



Detail

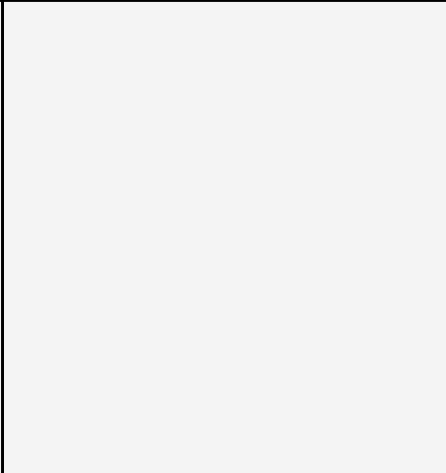
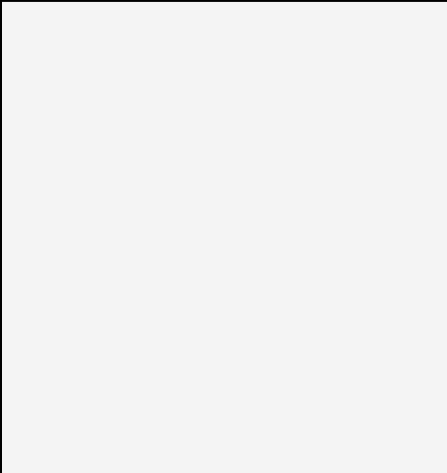
Detail

North



Detail

North

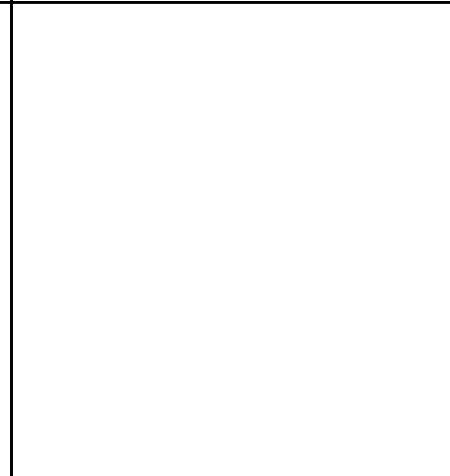
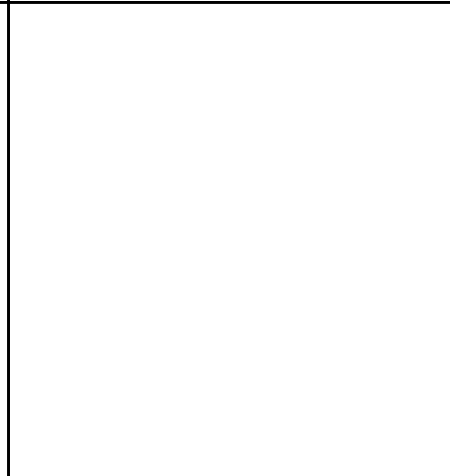
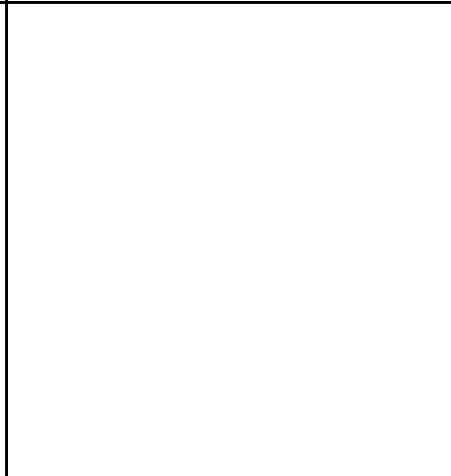
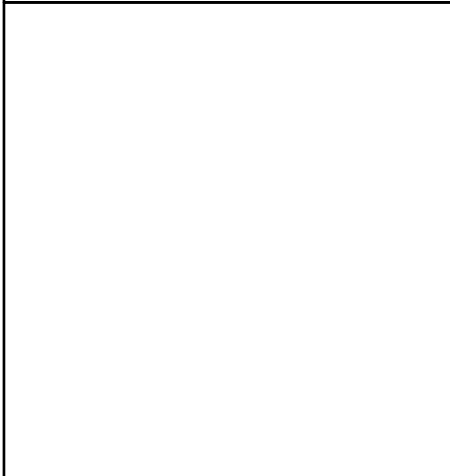


Site ID: OMPS-AS3



Detail

East



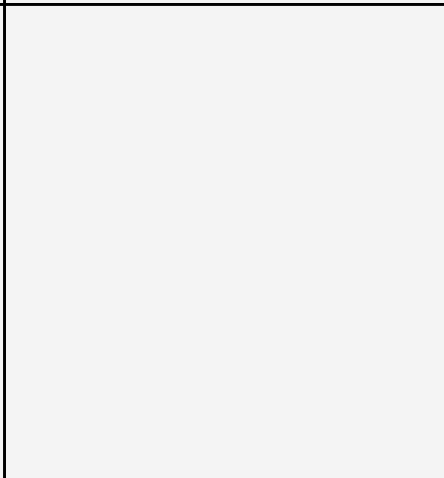
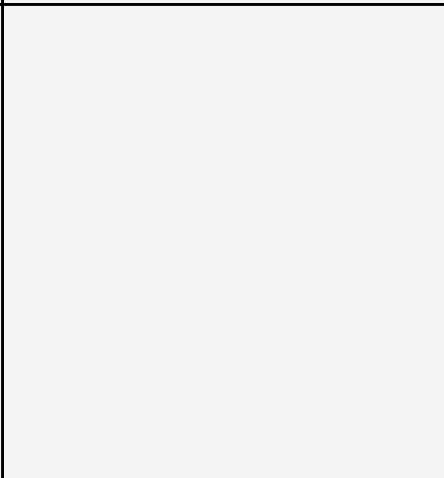
Detail



Detail



West



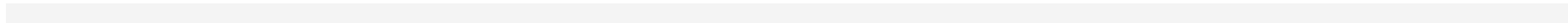
Site ID: OMPS-AS30



Detail

Detail

West

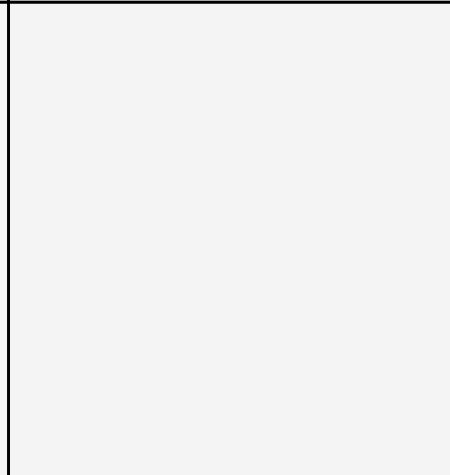
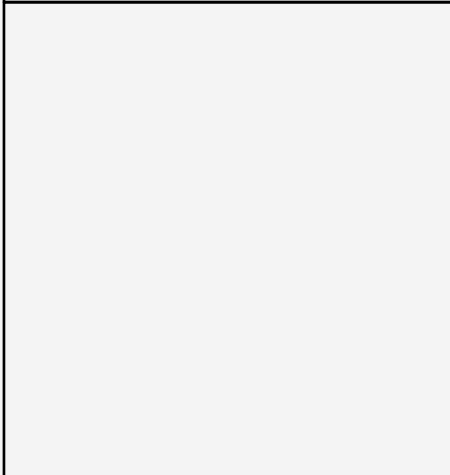


Site ID: OMPS-AS30



Detail

East





Site ID: OMPS-AS31



Detail

North

 A close-up photograph of soil and two light-colored, angular rocks. A metal ruler is placed horizontally below the rocks for scale, showing markings from 2 to 9 centimeters. The ruler has a red square marker at the 7 cm mark and a red "2m" label near the 4 cm mark.	 A photograph of a narrow path or driveway covered in dark, decomposed wood chips or mulch. The path is flanked by green grass and other vegetation.		

Detail

Detail

Detail



West

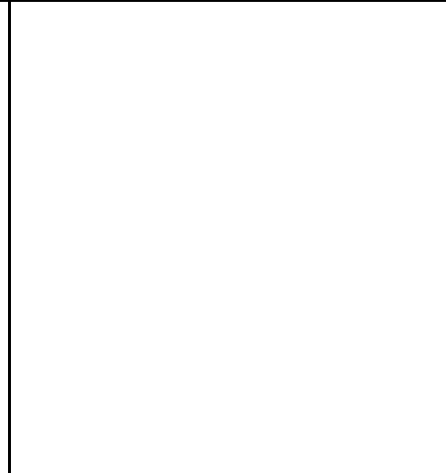
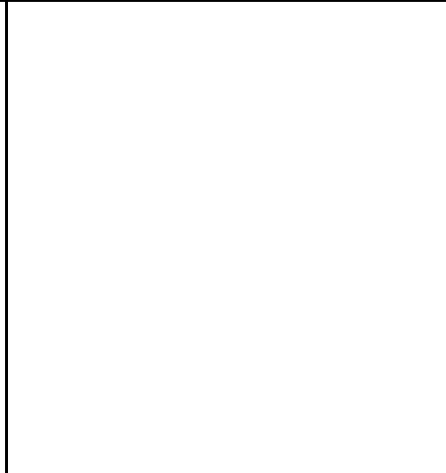
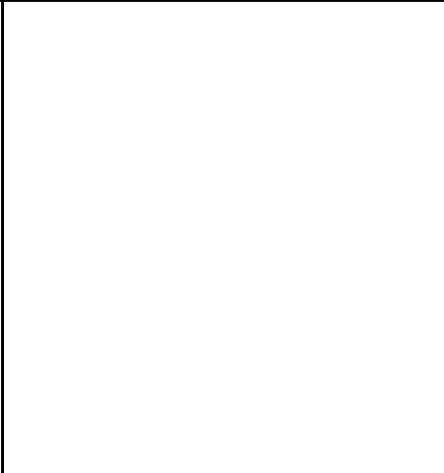
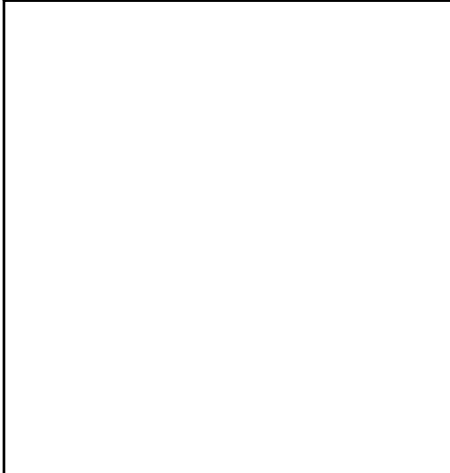
Site ID: OMPS-AS32



Detail

Detail

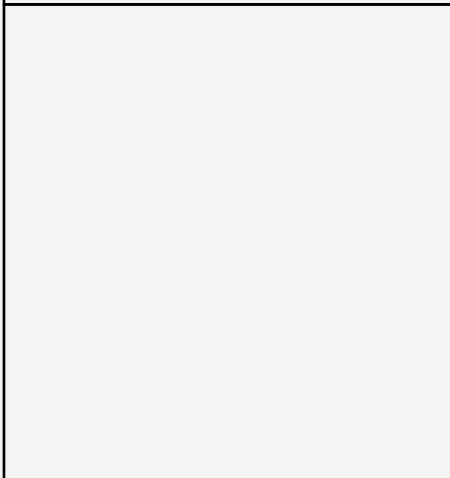
South



Detail

Detail

North



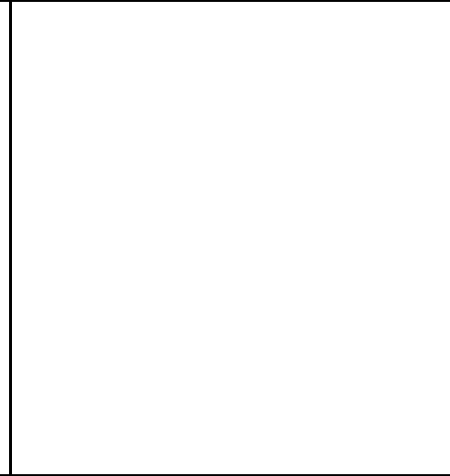
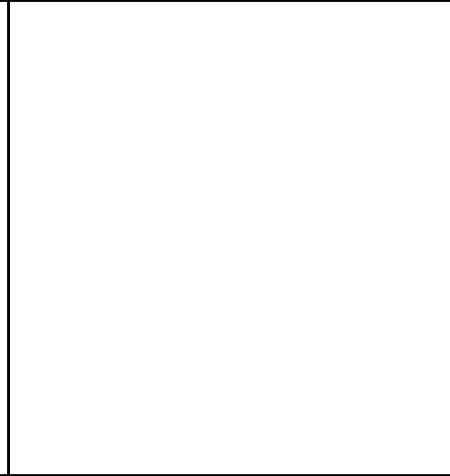
Site ID: OMPS-AS33



Detail

Detail

West



Detail



Detail



Detail



Detail



West

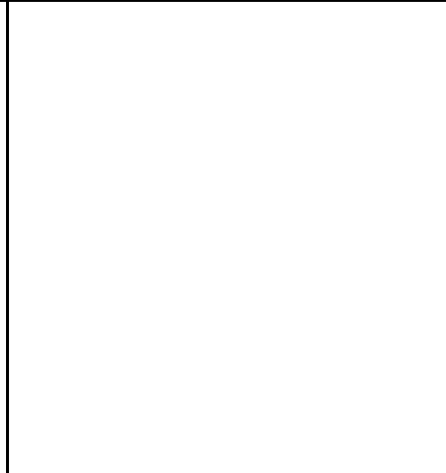
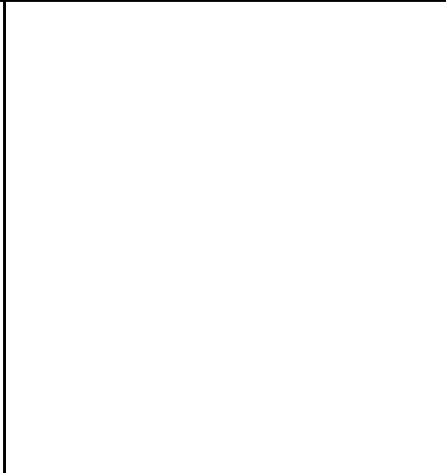
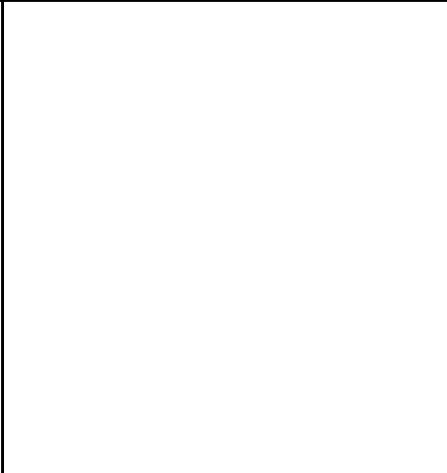
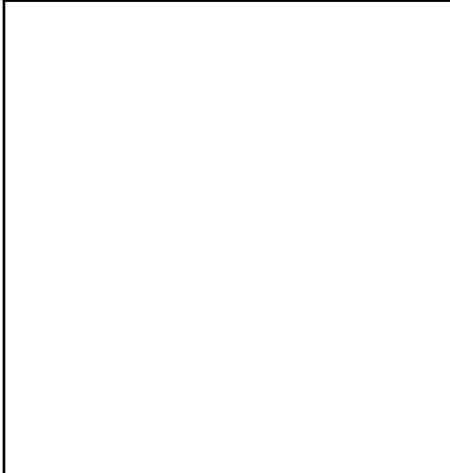
Site ID: OMPS-AS34



Detail

Detail

South



Detail



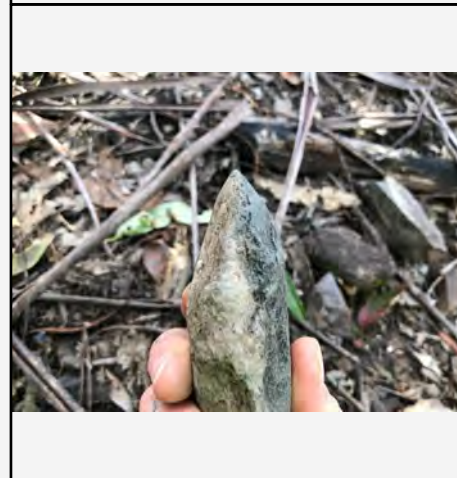
Detail



Detail





Detail

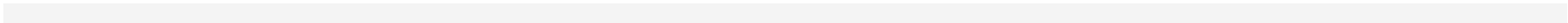


Detail

South

Detail	Detail	Detail	Detail
			
			

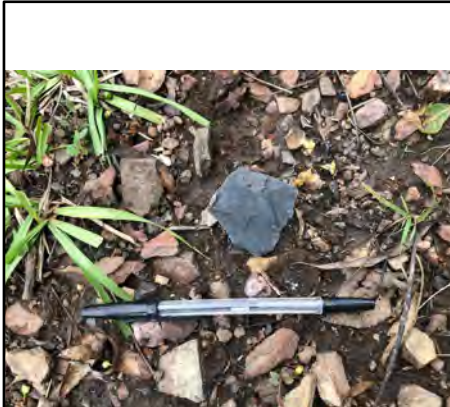
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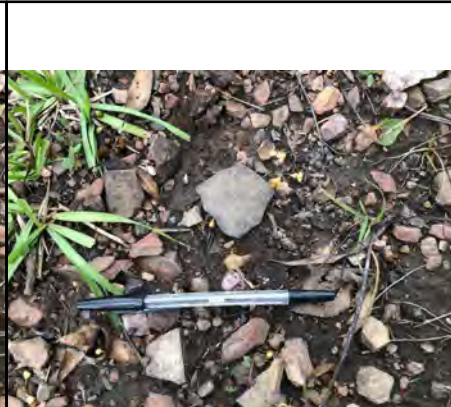


South

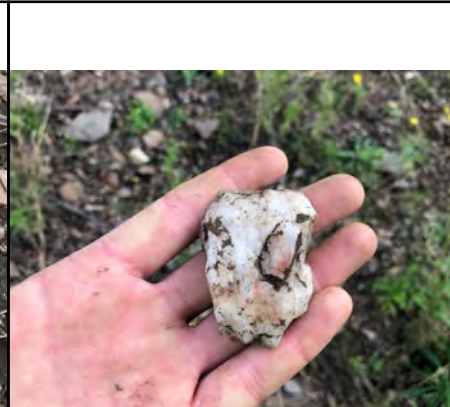
Detail



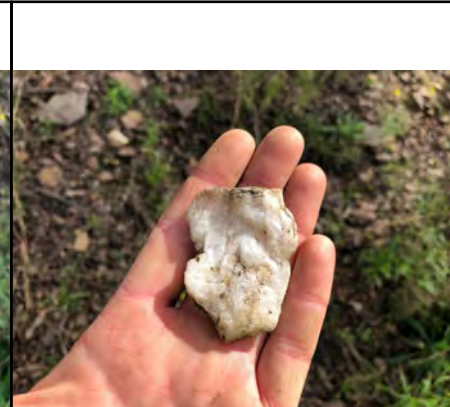
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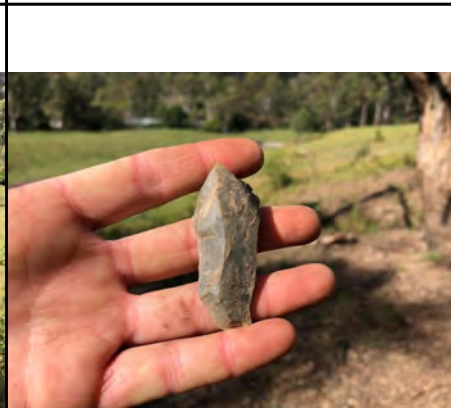
Detail



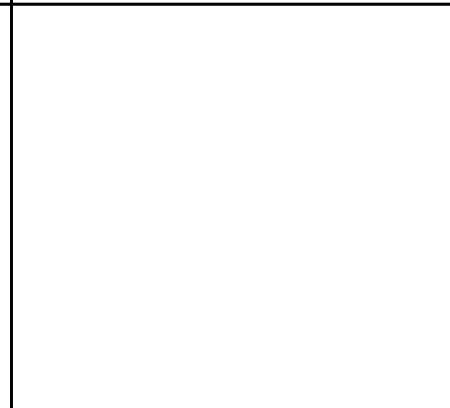
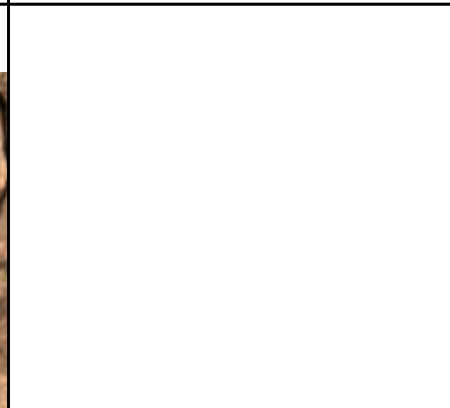
Detail



South



Detail



Site ID: OMPS-AS36



Detail



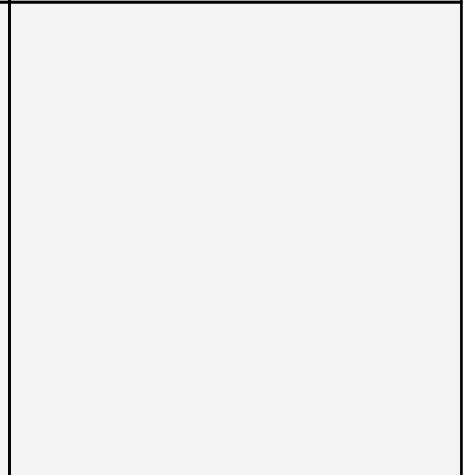
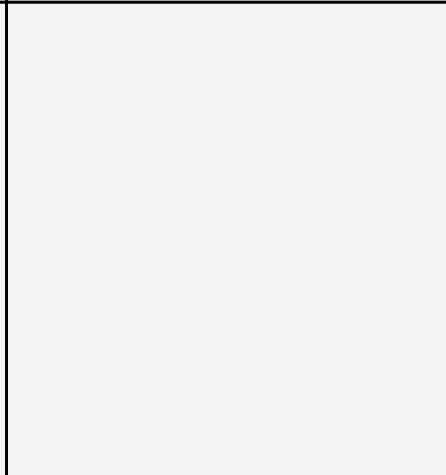
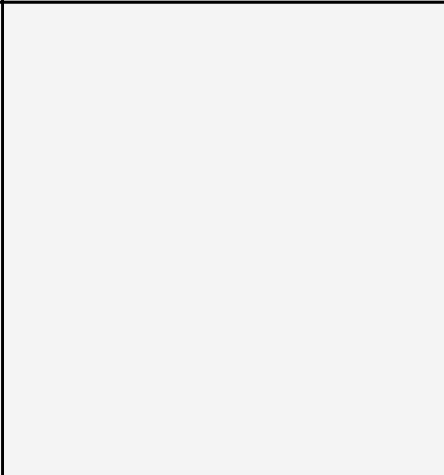
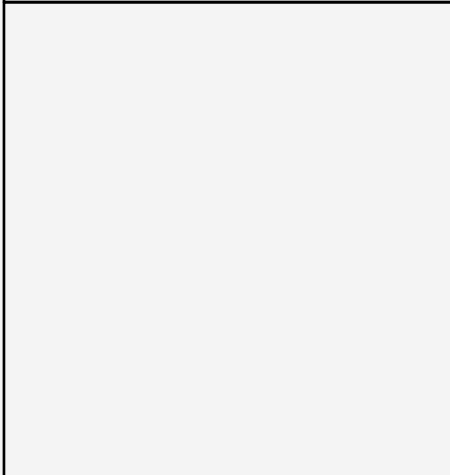
Detail



Detail



South



Site ID: OMPS-AS36

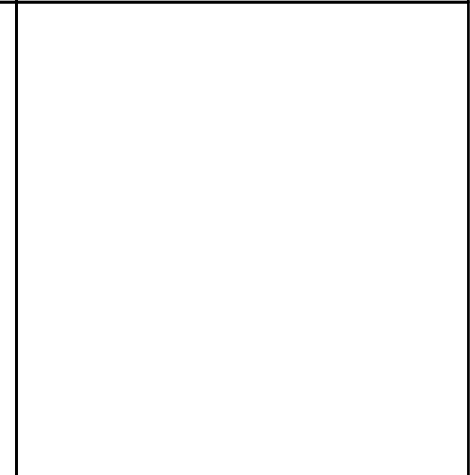
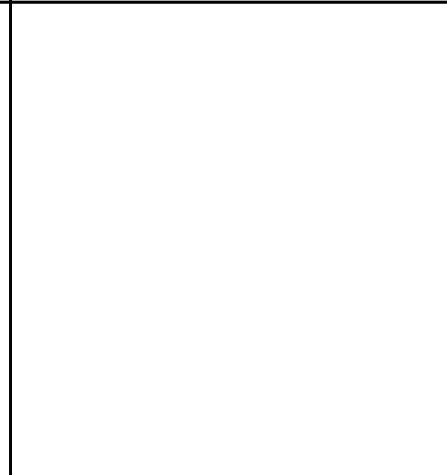
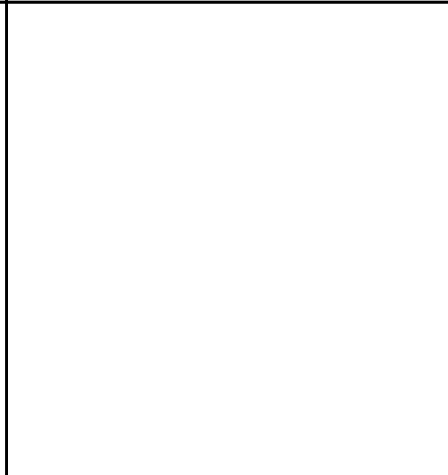
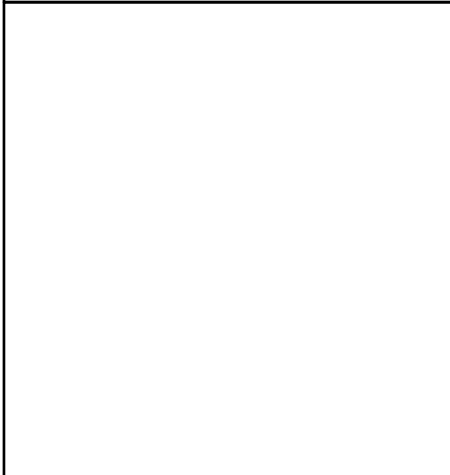


Detail

Detail

Detail

South



Detail



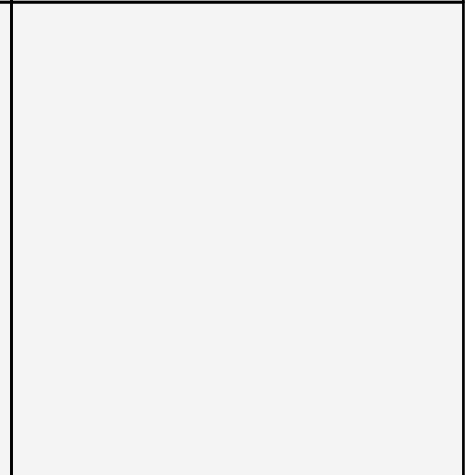
Detail



Detail

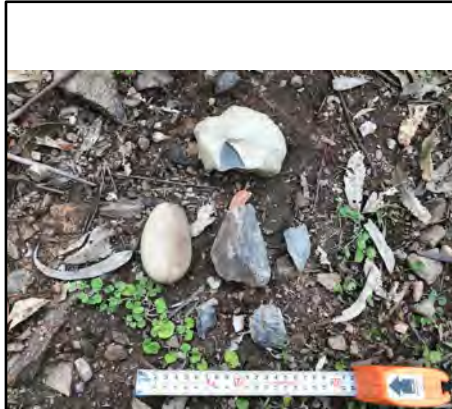


South



Site ID: OMPS-AS36

Detail



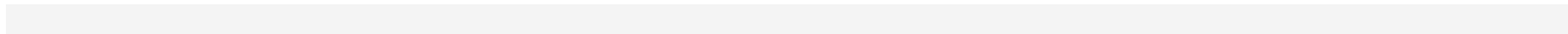
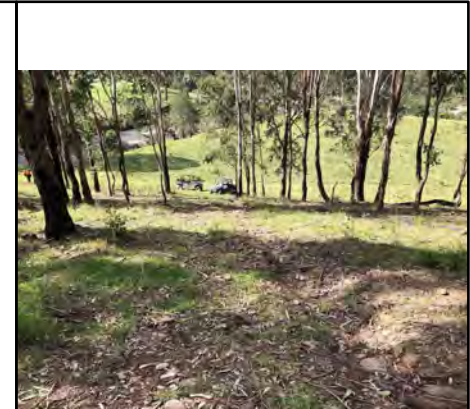
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Detail



South



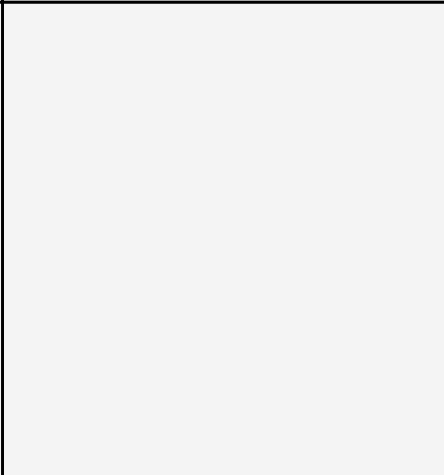
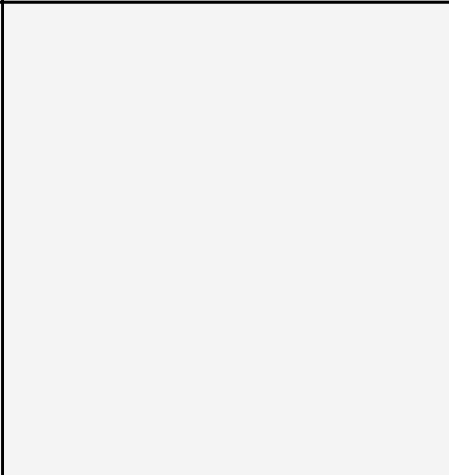
Site ID: OMPS-AS36



Detail

Detail

South



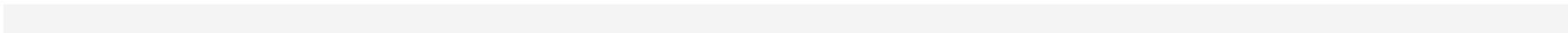
Site ID: OMPS-AS36



Detail

South

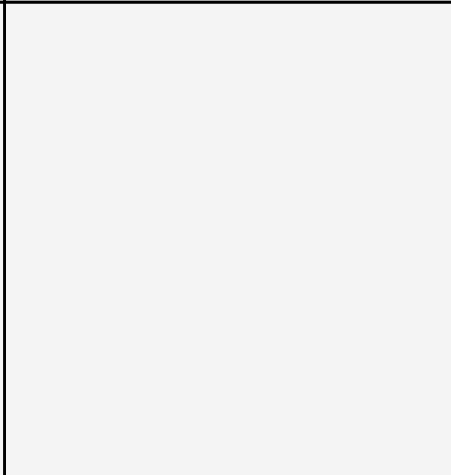


Site ID: OMPS-AS36



Detail

South



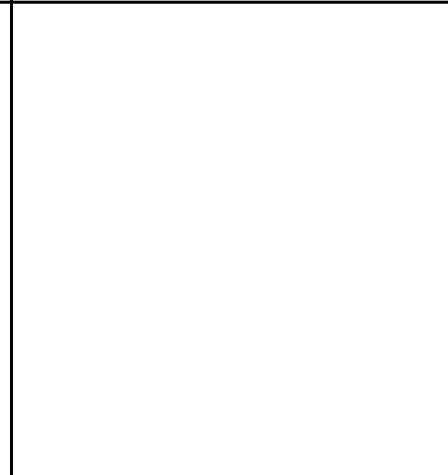
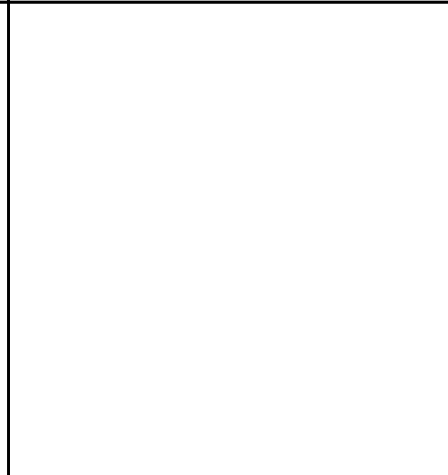
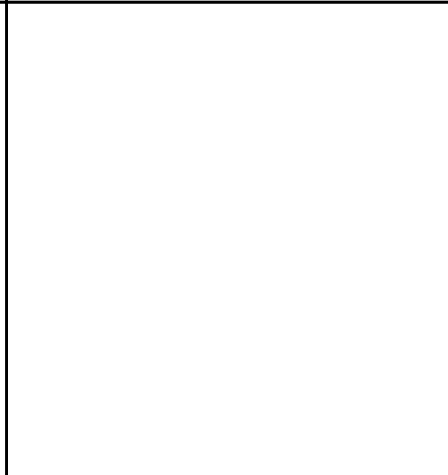
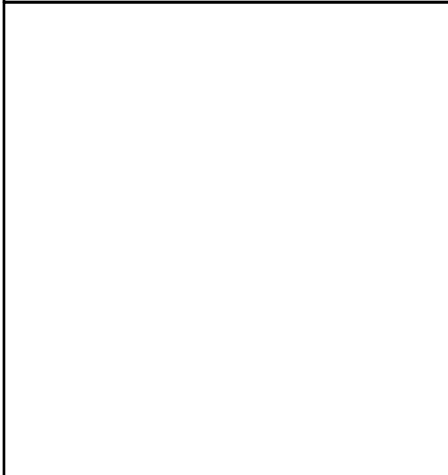
Site ID: OMPS-AS36



GPS

Anvil top

North



Site ID: OMPS-AS36



GPS	Anvil top	North	

Site ID: OMPS-AS36



GPS



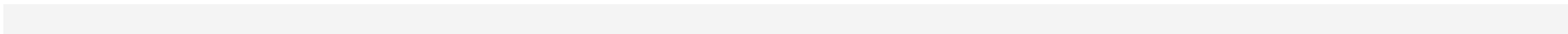
Detail



Detail



East



Site ID: OMPS-AS36



GPS	Detail	Detail	East

Site ID: OMPS-AS36



GPS



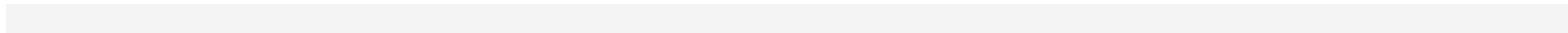
Detail



Detail



East



Site ID: OMPS-AS36



GPS



Detail



Detail



North



Site ID: OMPS-AS36



GPS



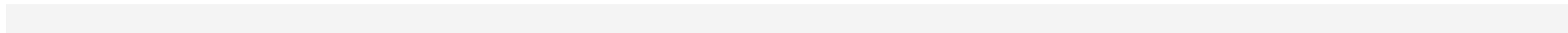
Detail



Detail







North



Site ID: OMPS-AS36



GPS	Detail	Detail	North
			

Site ID: OMPS-AS36



GPS



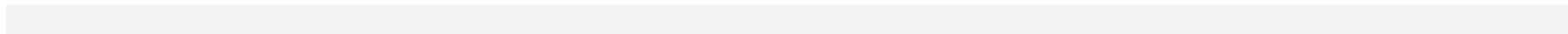
Detail



Detail



North



Site ID: OMPS-AS36



GPS



Detail



Detail



West



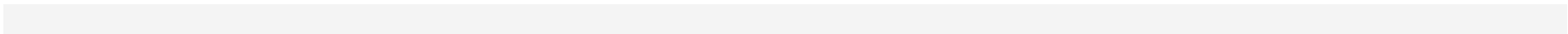
Site ID: OMPS-AS36



GPS





Detail

North



Site ID: OMPS-AS36



GPS	Dorsal surface	Detail	North
			

Site ID: OMPS-AS36







GPS

Dorsal surface

Ventral surface

East





Site ID: OMPS-AS36



GPS	Dorsal surface	Ventral surface	North





Site ID: OMPS-AS36



GPS	Dorsal surface	Ventral surface	North
			

Site ID: OMPS-AS36



GPS	Dorsal surface	Ventral surface	East
			

Site ID: OMPS-AS36

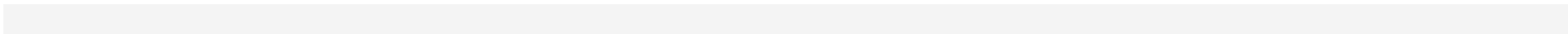


GPS

Dorsal surface





Ventral surface

North



Site ID: OMPS-AS36



GPS	Edge of axe	Cortex surface	North
			

Site ID: OMPS-AS36



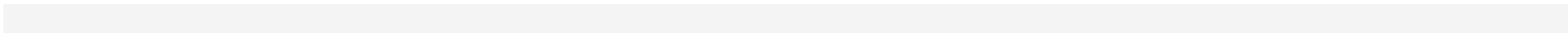
GPS



Scarred tree







Detail



Site ID: OMPS-AS36



GPS	Ventral surface	Cortex	South
			

Site ID: OMPS-AS36



GPS



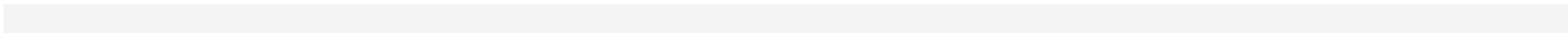
Ventral surface



Dorsal surface







East



Site ID: OMPS-AS36



GPS	Ventral surface	Dorsal surface	North
			

Site ID: OMPS-AS36



GPS



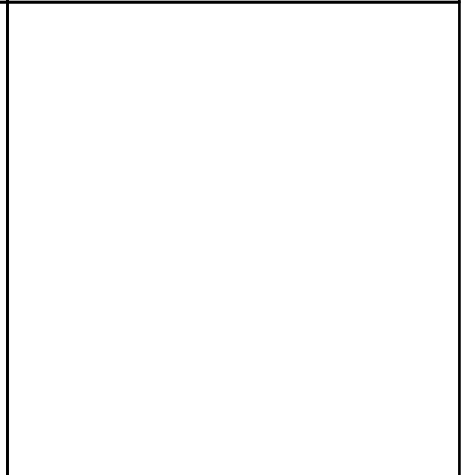
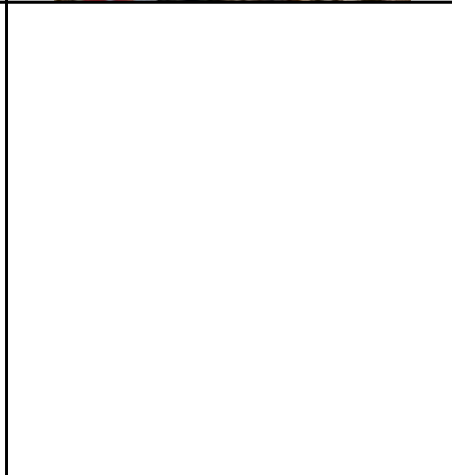
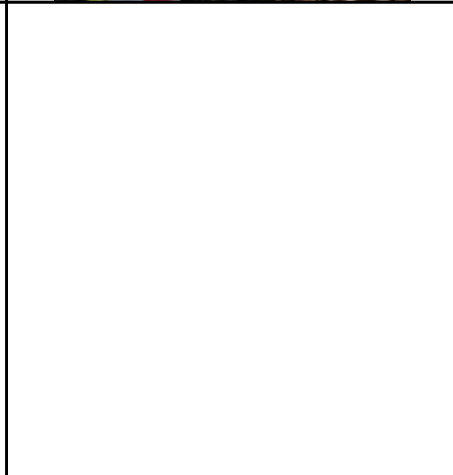
Ventral surface



Dorsal surface







North



Site ID: OMPS-AS36



GPS	Ventral surface	Dorsal surface	North
			

Site ID: OMPS-AS36

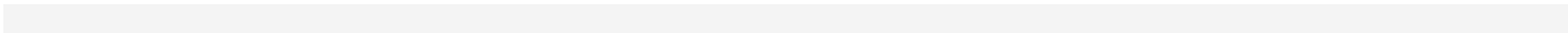
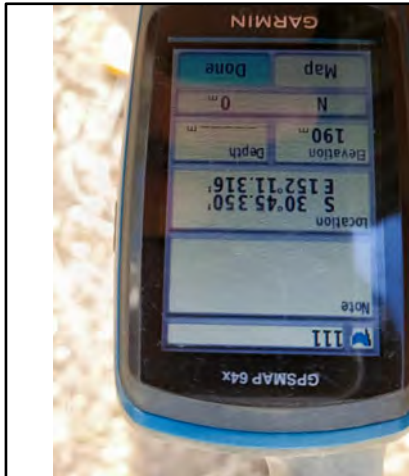


GPS

Ventral surface




Dorsal surface

South



Site ID: OMPS-AS36



GPS	Ventral surface	Dorsal surface	
			

Site ID: OMPS-AS36

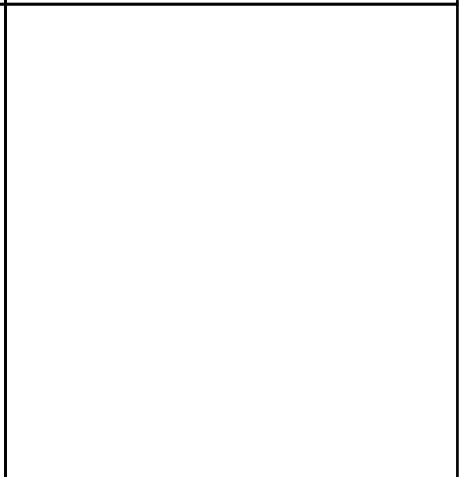
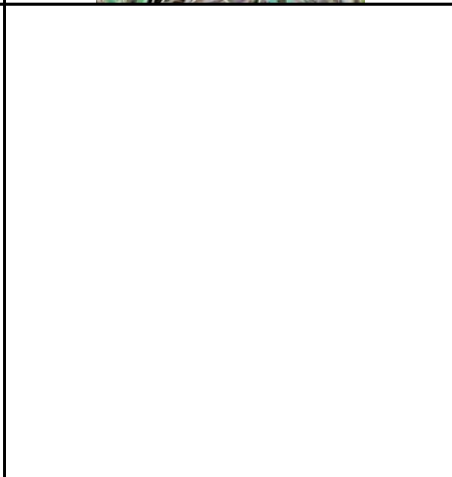
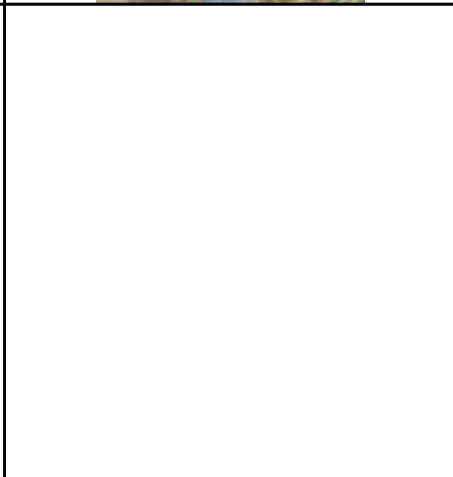
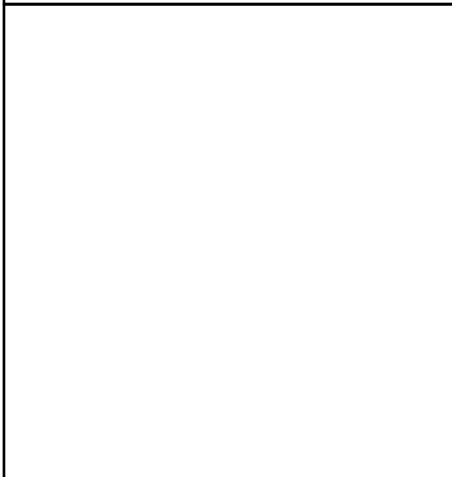


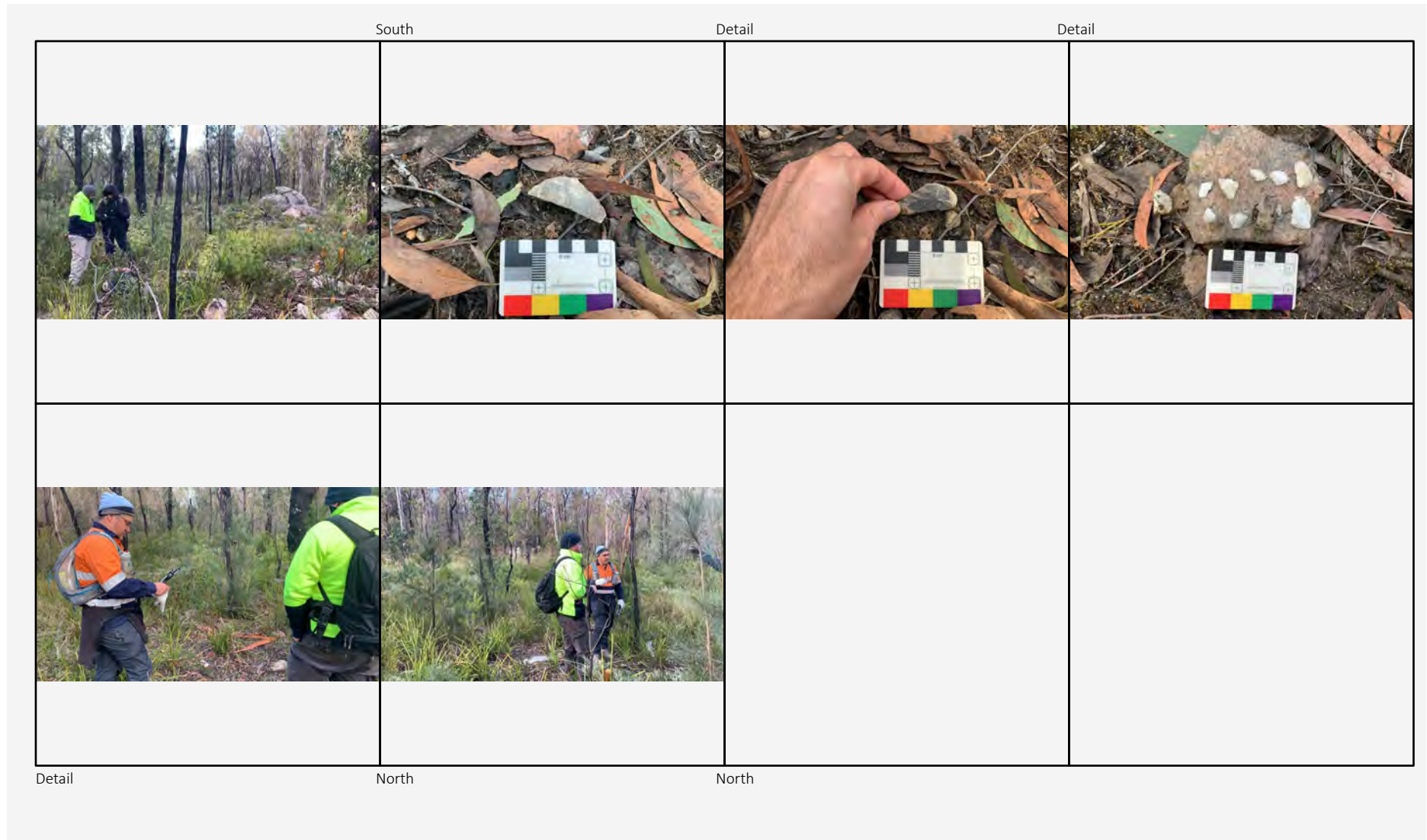
Ventral surface

GPS

Dorsal surface

North








Site ID: OMPS-AS37

Detail

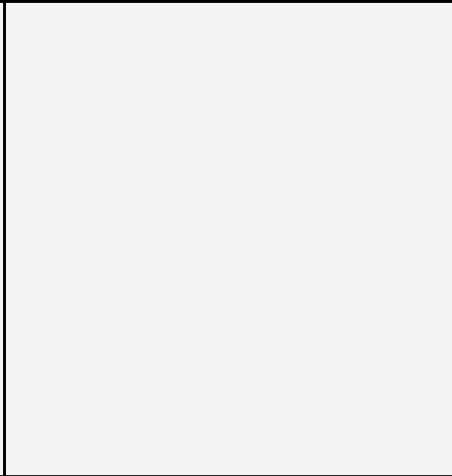
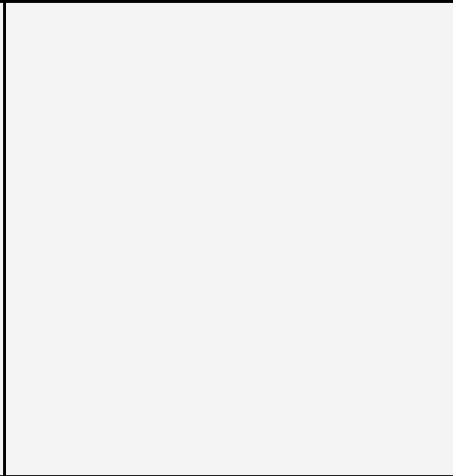
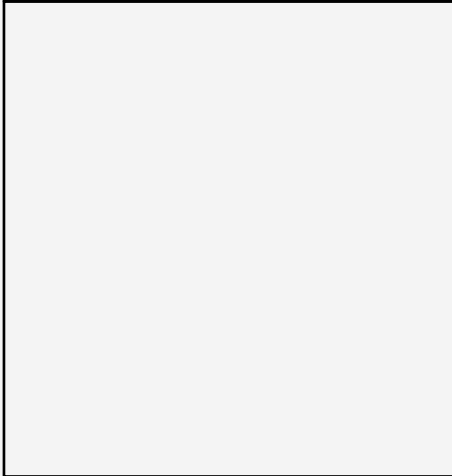
North

North

Detail

North






Detail

North

Detail



North

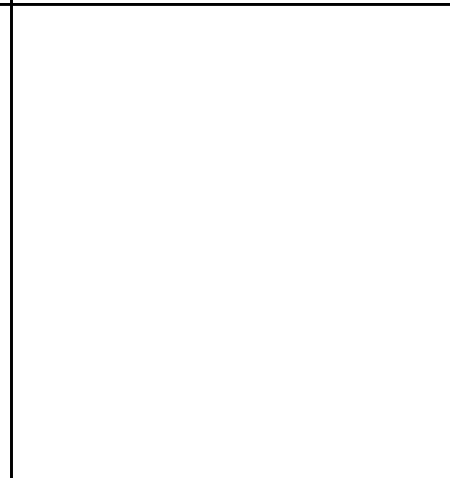
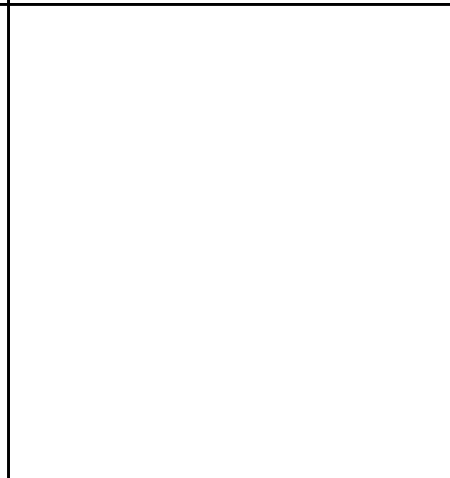
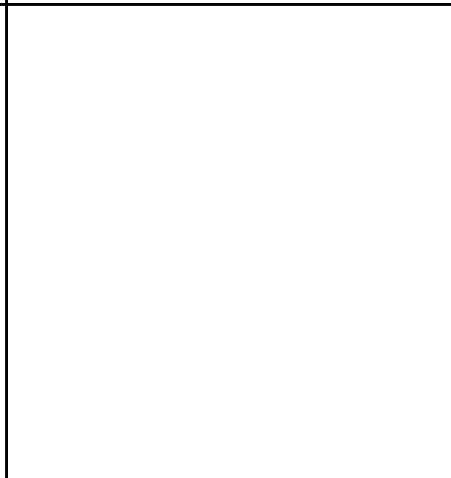
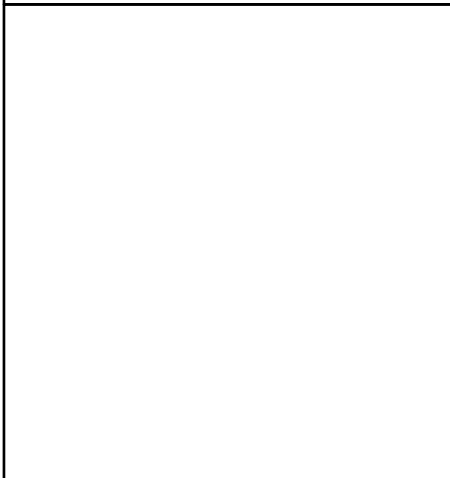
Detail	West	Buried artefacts	
			

Site ID: OMPS-AS4



Detail

East



Site ID: OMPS-AS4



Dorsal surface

Ventral surface

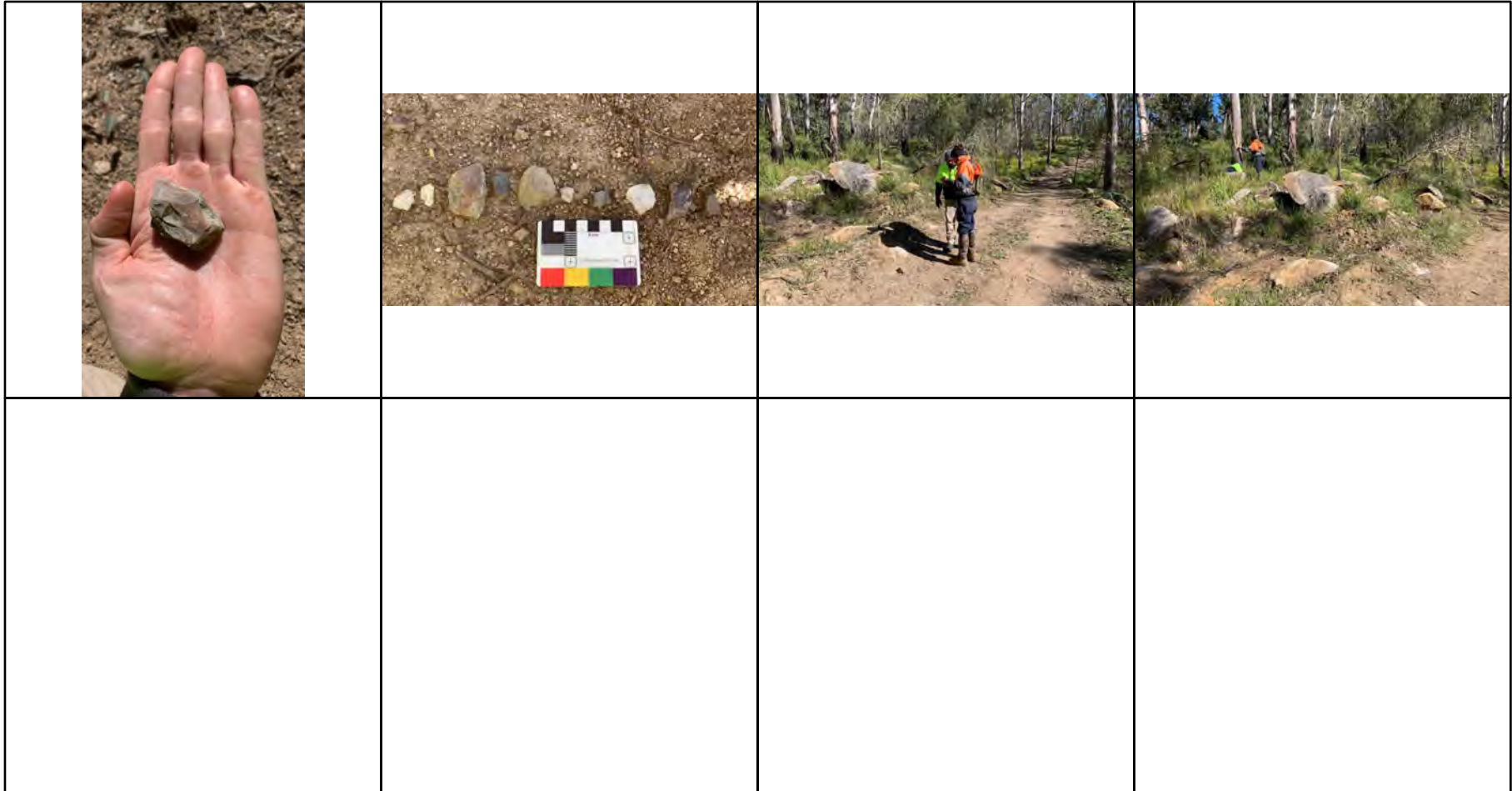
East



Detail

Artefacts

North



Artefact relocation- UR- Detail

Detail



North east



Artefact relocation - UR - Detail



Site ID: OMPS-AS42



Detail

South

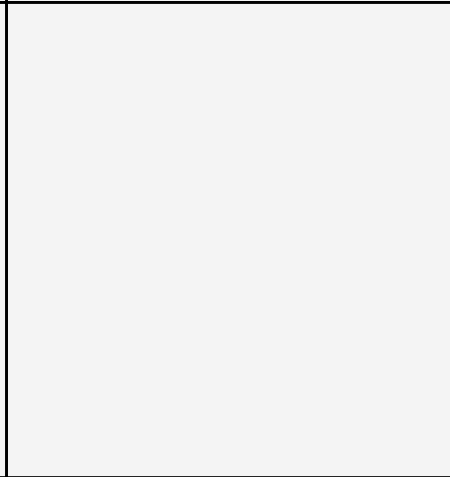
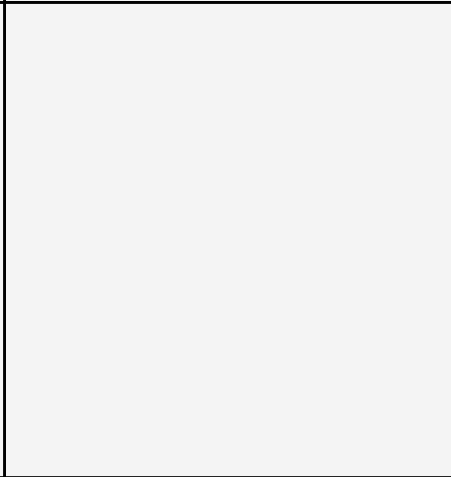
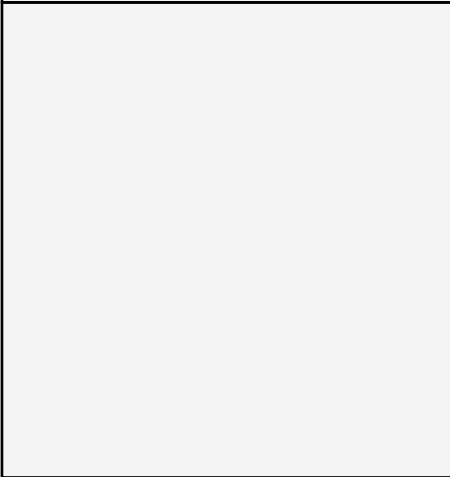
North

South



Detail

North

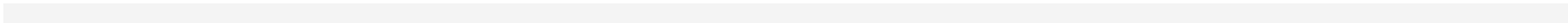


Site ID: OMPS-AS5






Detail

North



Site ID: OMPS-AS5



Ventral surface	Dorsal surface	North	
			

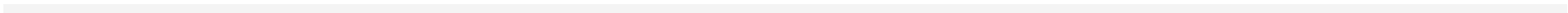
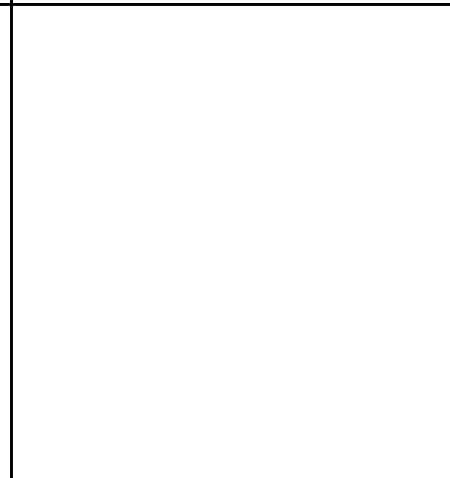
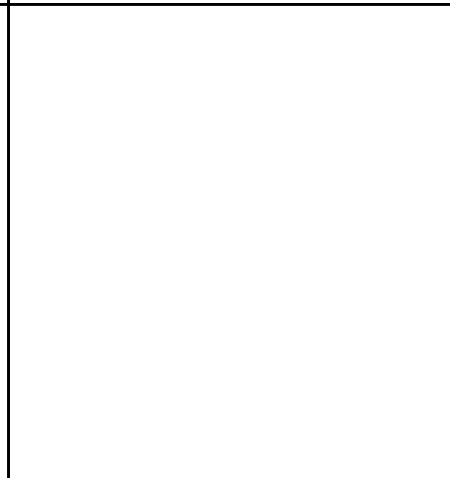
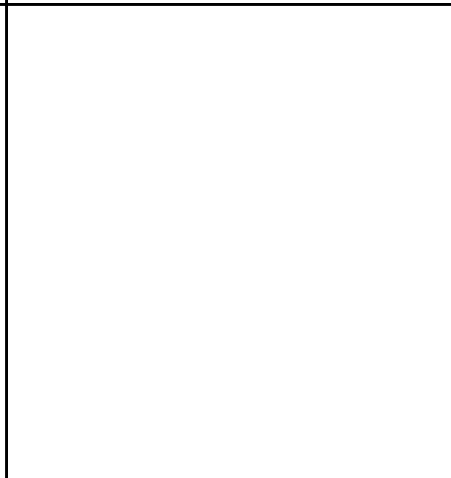
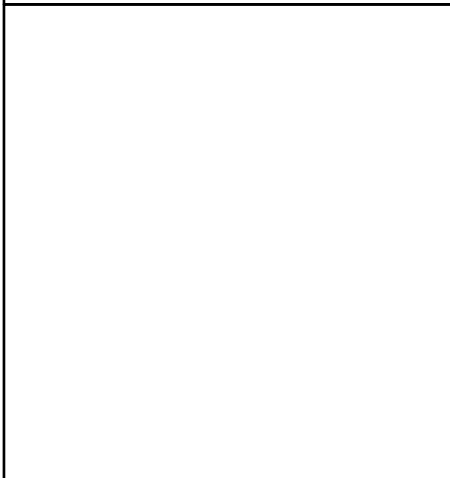
Site ID: OMPS-AS6








Detail

Detail

North



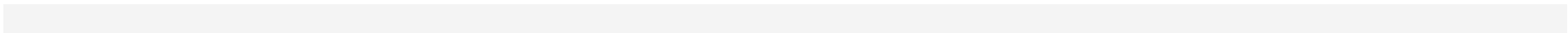
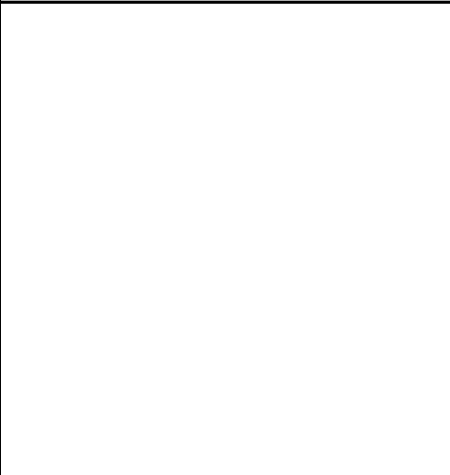
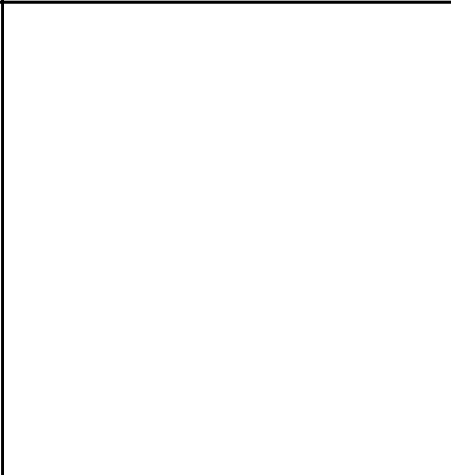
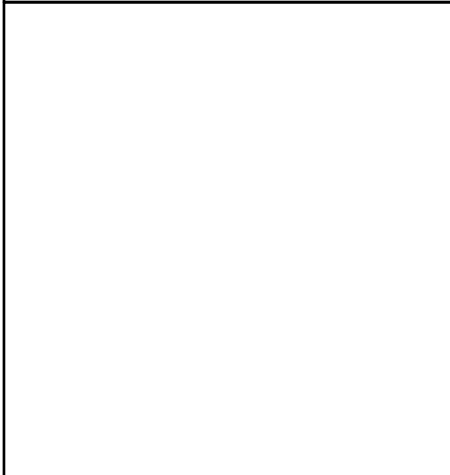
Detail	Detail	North east	Detail
			
			

Site ID: OMPS-AS6



Detail

East

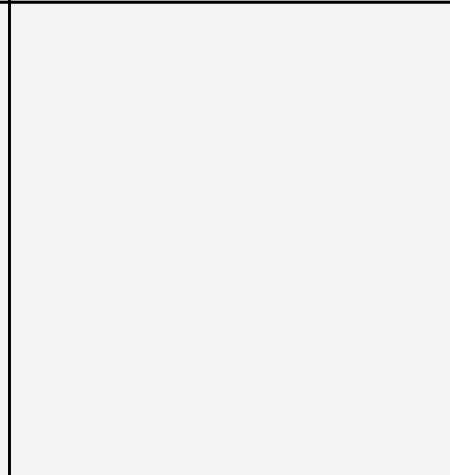
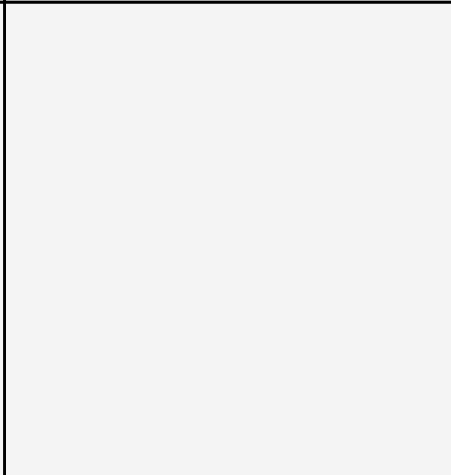


Site ID: OMPS-AS6



Detail

East




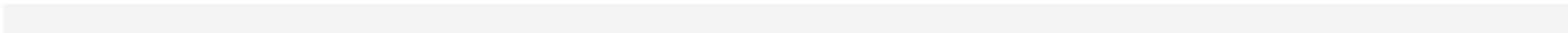
Site ID: OMPS-AS6



Detail

North

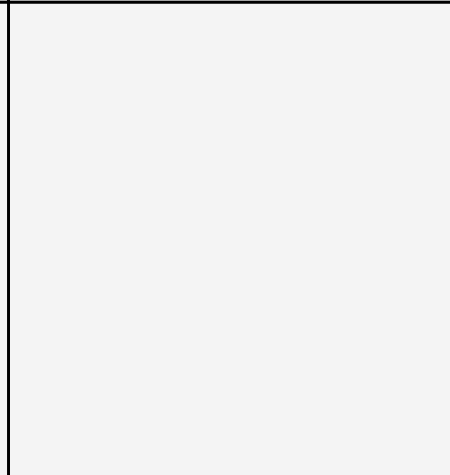


Site ID: OMPS-AS6



Detail

North













Site ID: OMPS-AS6

Dorsal surface

Ventral surface

East

Detail	North	Basalt core	North
			
			
Detail	North	Detail	North

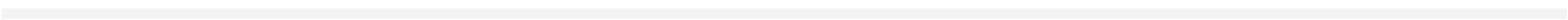
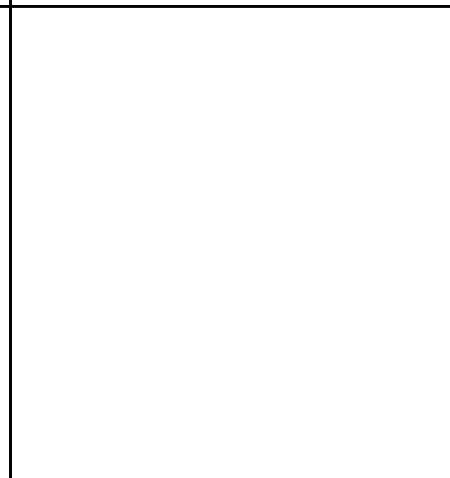
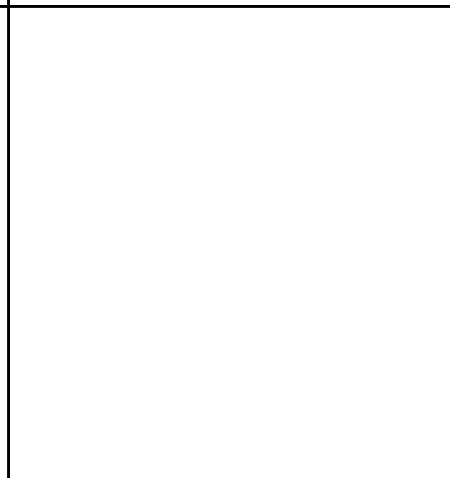
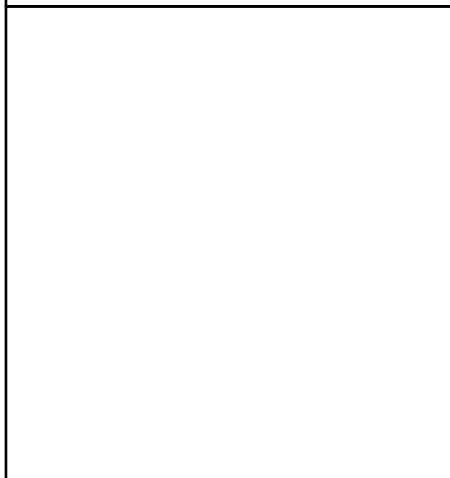
Site ID: OMPS-AS8






Detail

Detail

South west



Detail	Detail	North	
			

Site ID: OMPS-AS8



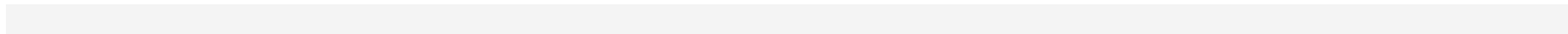
Detail



Detail



North

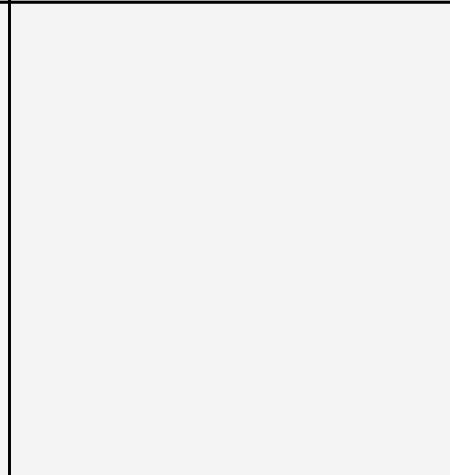
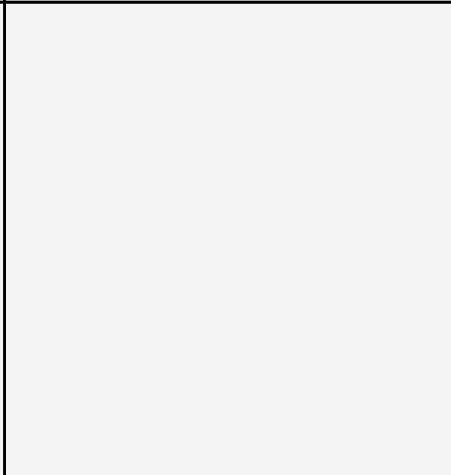
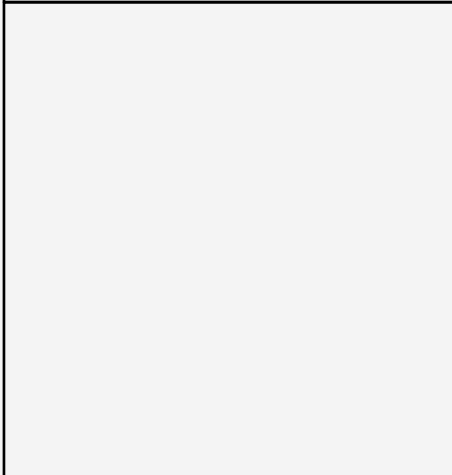


Site ID: OMPS-AS8



Detail

North

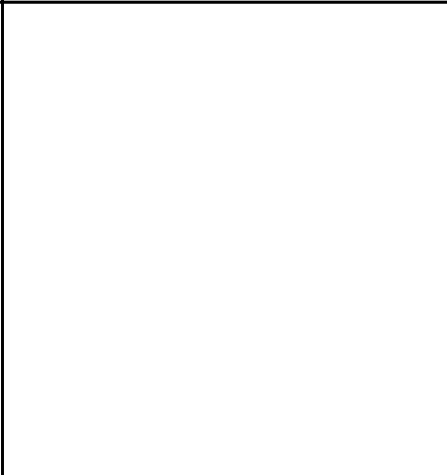
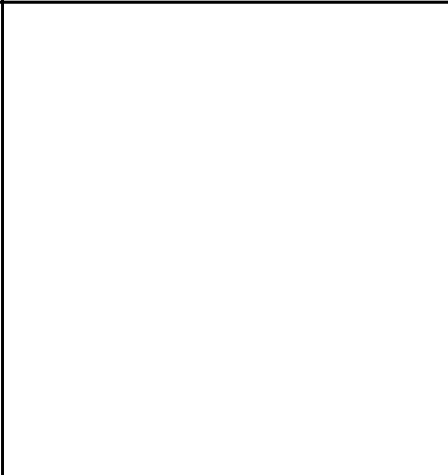
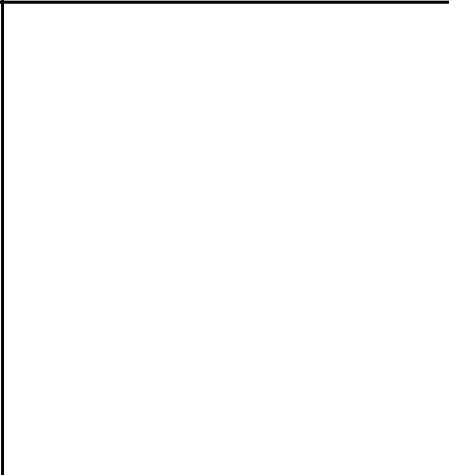
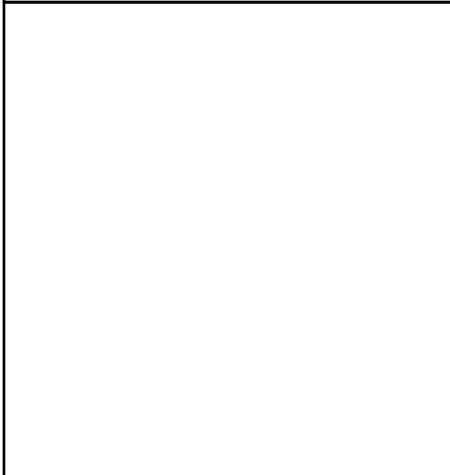


Site ID: OMPS-AS8



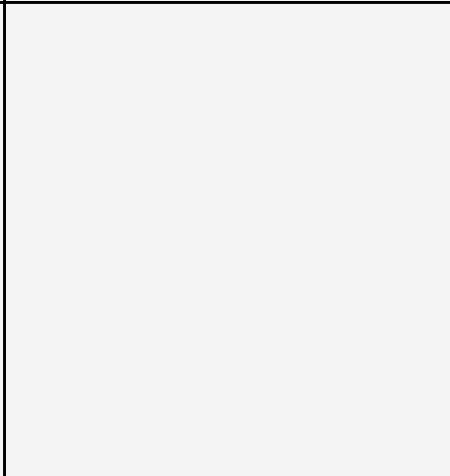
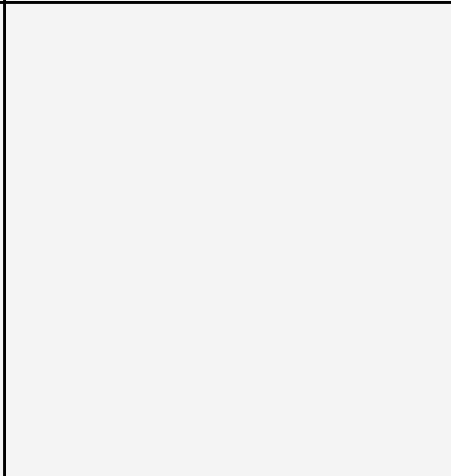
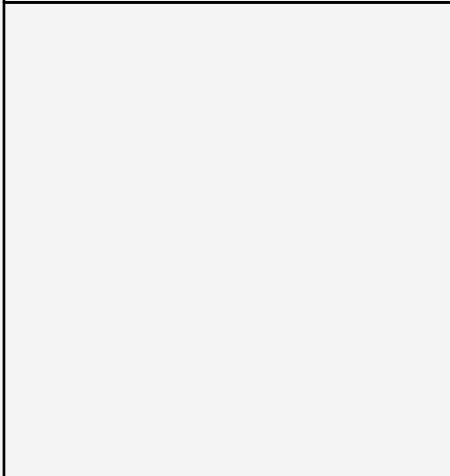
Detail

North



Detail

West



Site ID: OMPS-AS9

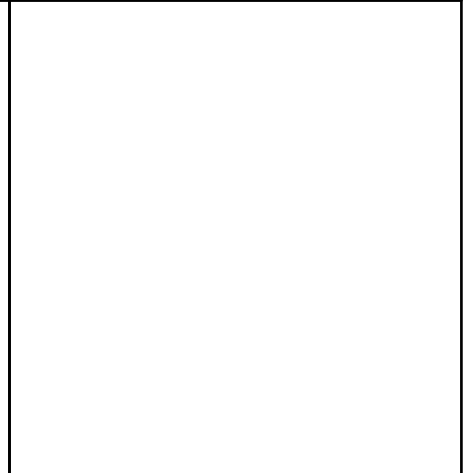
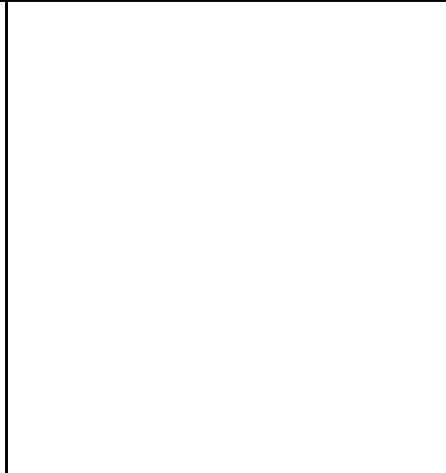
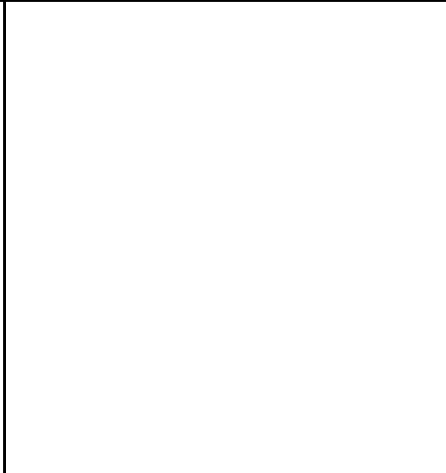


Detail

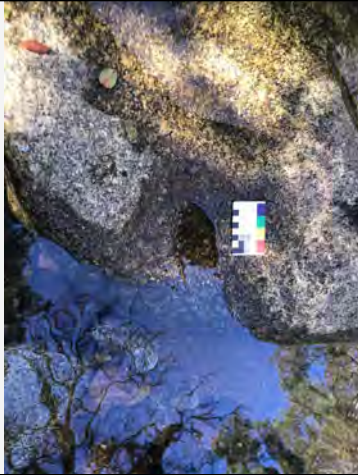
West

Detail

West



Detail



South

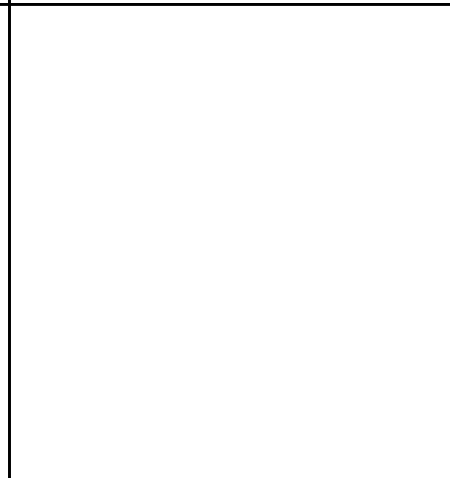
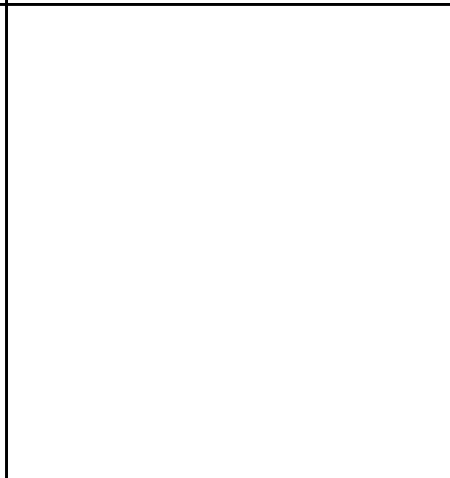
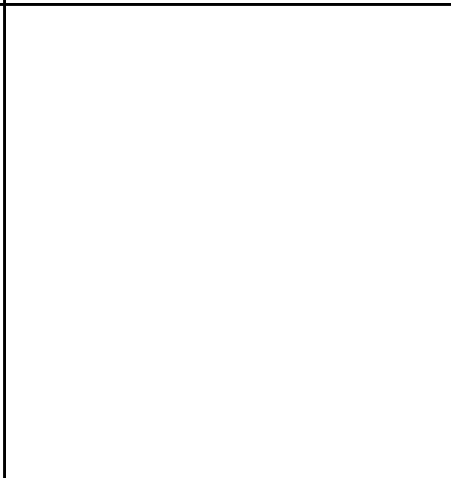
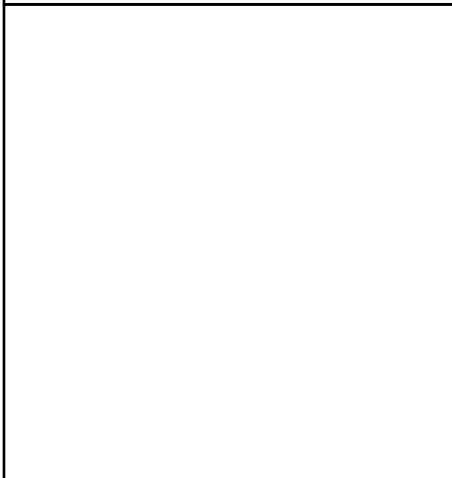


Site ID: OMPS-IF1



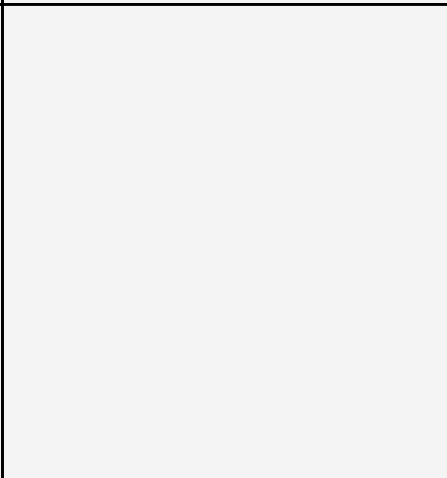
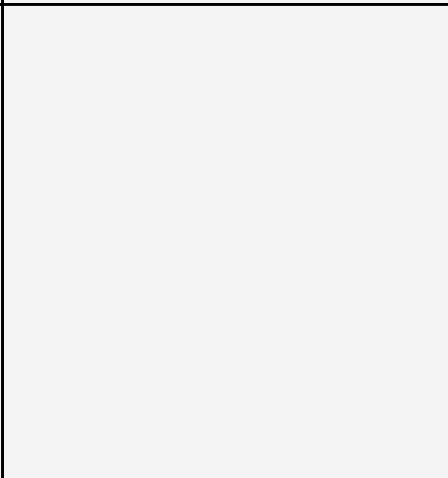
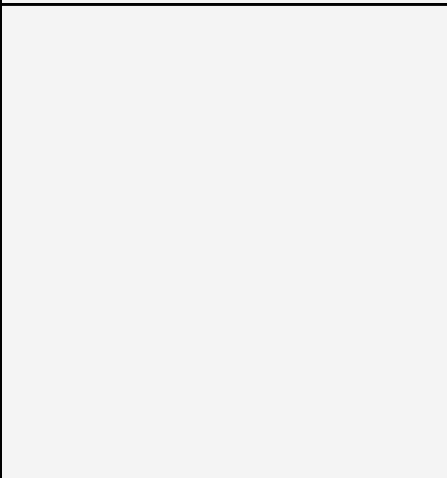
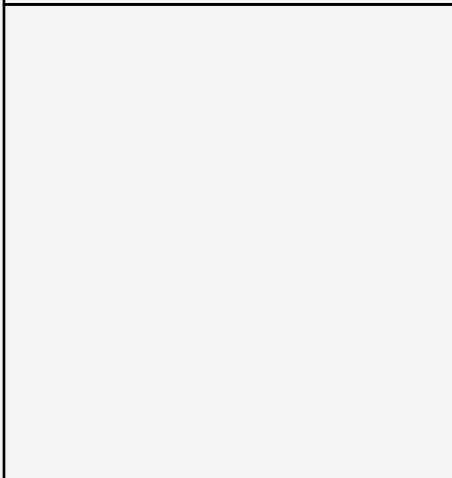
Detail

North



Detail

North



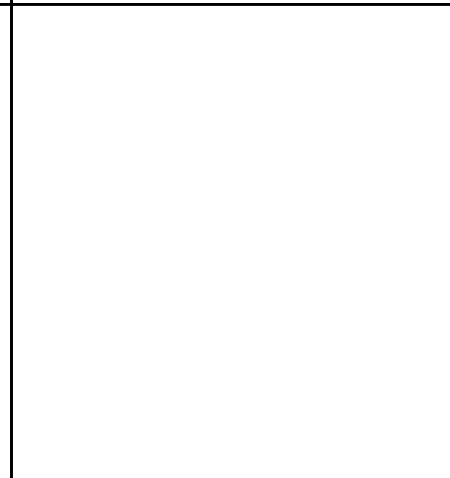
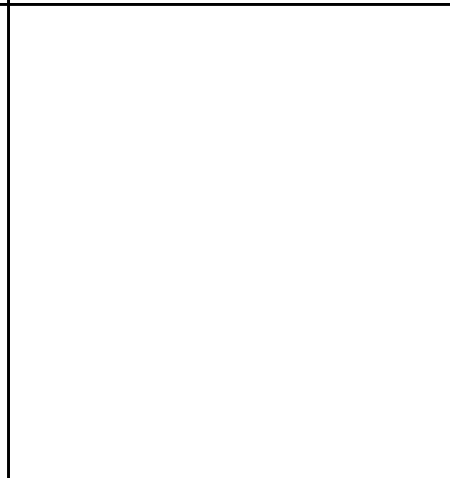
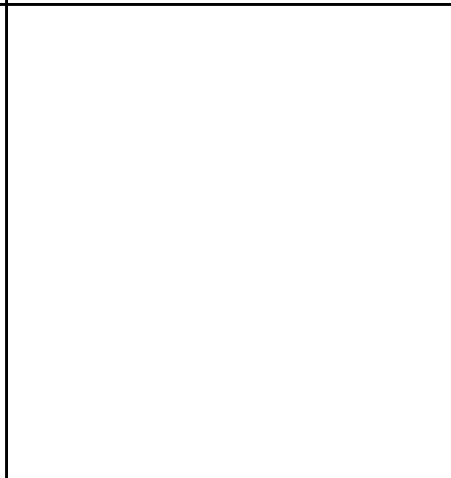
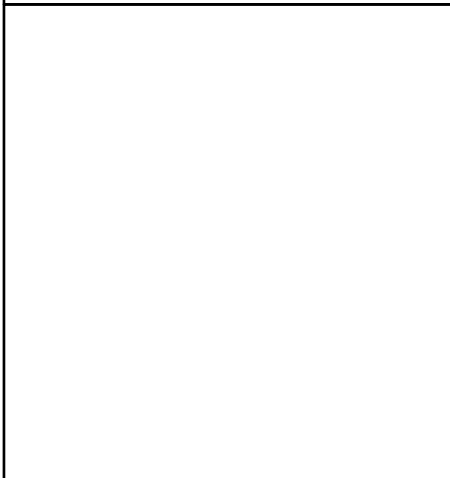
Site ID: OMPS-IF11



Detail

Detail

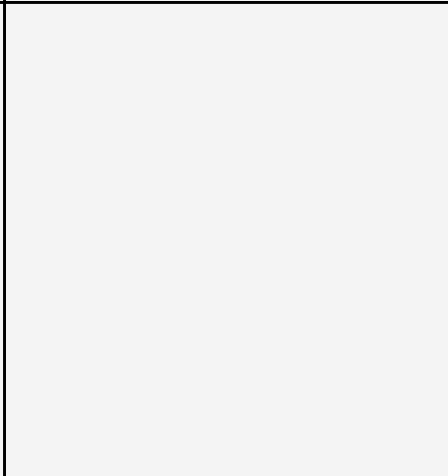
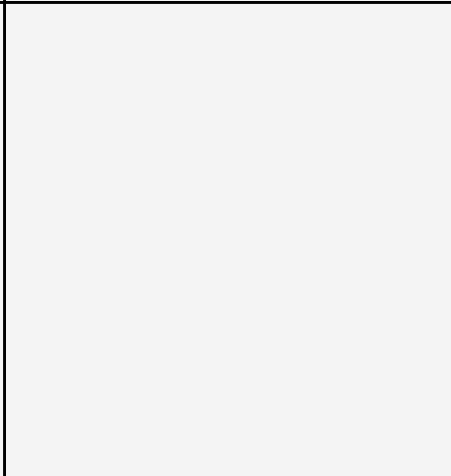
West



Detail

Detail

West





Site ID: OMPS-IF13



Dorsal surface

Ventral surface

North

 A photograph showing the dorsal surface of a dark, rounded rock. A red and white striped scale bar is placed horizontally above the rock for size reference. The rock is surrounded by dry leaves and some green grass.	 A photograph showing the ventral surface of the same dark, rounded rock. A red and white striped scale bar is placed horizontally above the rock. The rock is surrounded by dry leaves and some green grass.	 A photograph showing a view towards the north, featuring a wooded area with tall, thin trees and a grassy foreground.	

Detail

Detail

Detail

North



Site ID: OMPS-IF15



East



Detail



Detail



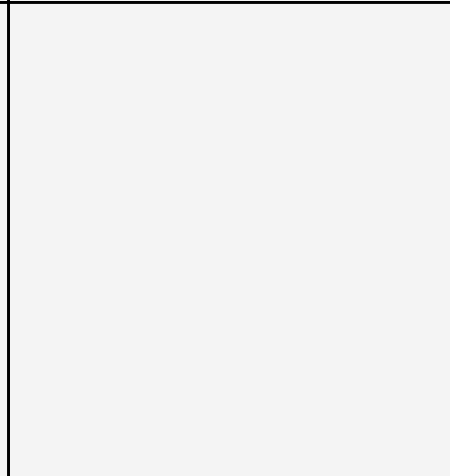
Detail



Detail

Detail

West

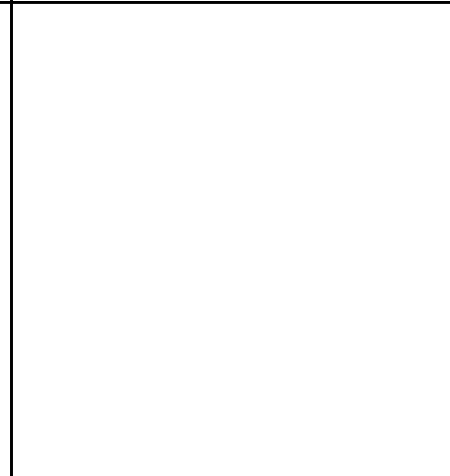
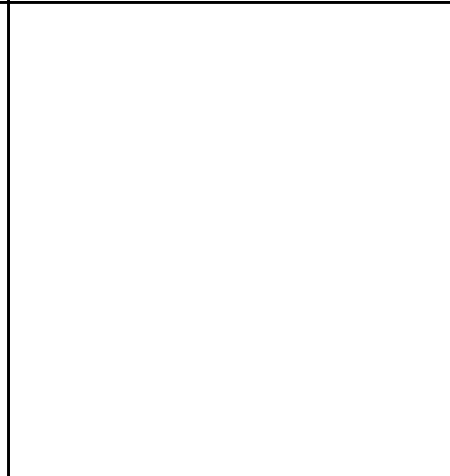
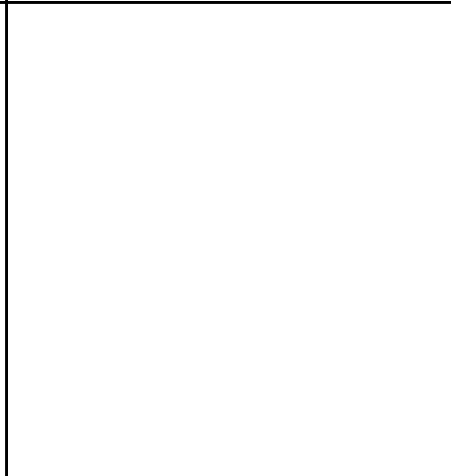
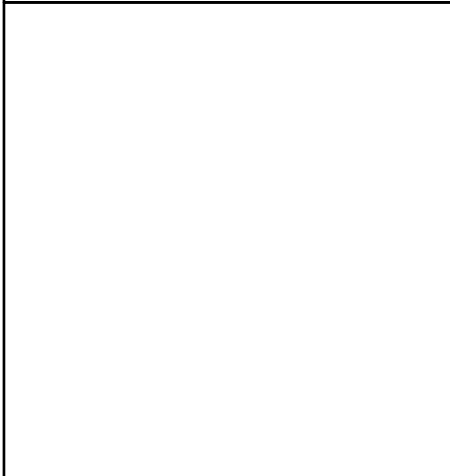


Site ID: OMPS-IF17



West

Detail



Site ID: OMPS-IF18



Dorsal surface

Ventral surface

North



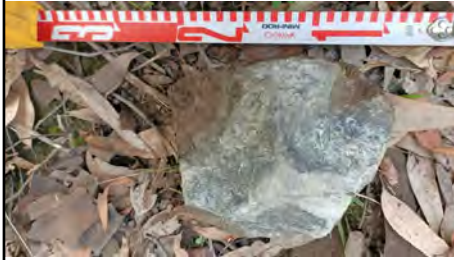


Site ID: OMPS-IF19



Cortex on core

Detail

North east

 A close-up photograph of a grey, angular rock fragment (cortex) resting on a bed of dry, brown leaves. A red and white striped measuring tape is placed horizontally above the rock for scale.	 A vertical close-up photograph of the same rock fragment, showing its texture and shape. A red and white striped measuring tape is placed vertically to the left of the rock.	 A photograph showing a forest floor covered in dry leaves and sparse green vegetation. Several thin tree trunks are visible in the background, indicating a wooded area.	

Dorsal surface

Ventral surface

North






Site ID: OMPS-IF20



Dorsal surface




Ventral surface

East

 A photograph showing the dorsal surface of a grey, angular rock. The rock is surrounded by dry, brown leaves and some green vegetation. A red and white striped Mini-Rod scale is placed horizontally in front of the rock for scale. The scale has the text "MINI-ROD" and "EMM" visible.	 A photograph showing the ventral surface of the same grey rock. The rock is surrounded by dry, brown leaves and some green vegetation. A red and white striped Mini-Rod scale is placed horizontally in front of the rock for scale. The scale has the text "MINI-ROD" and "EMM" visible.	 A photograph showing the site from an eastern perspective. The rock is visible in the foreground, surrounded by dry leaves and vegetation. In the background, there are several trees with light-colored bark, possibly birches, in a wooded area.	

Site ID: OMPS-IF21



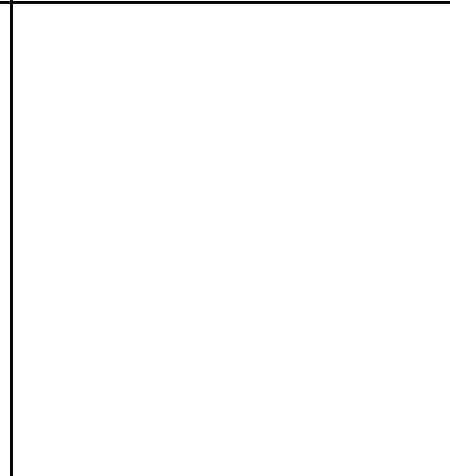
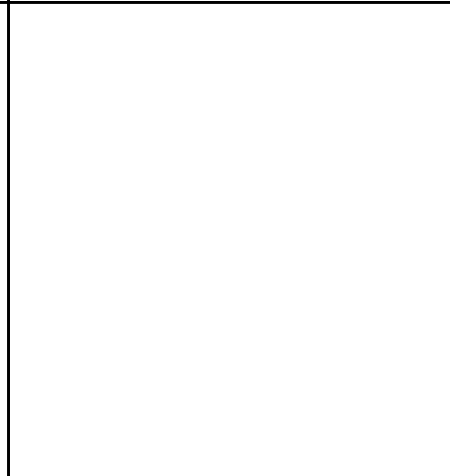
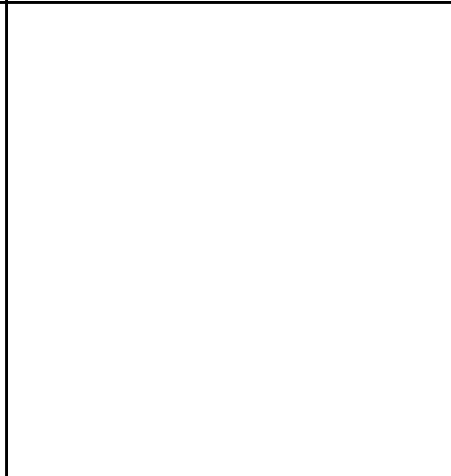
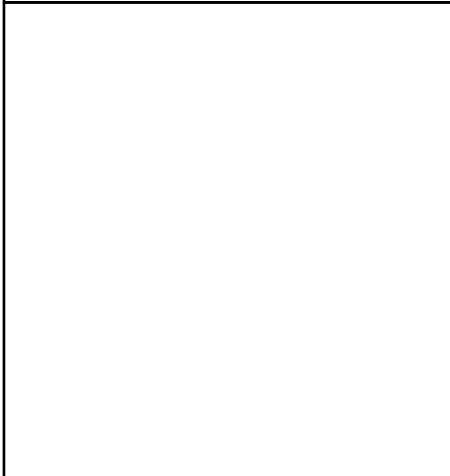
Cortex core surface	Detail	East	
			

Site ID: OMPS-IF22

Detail

Detail

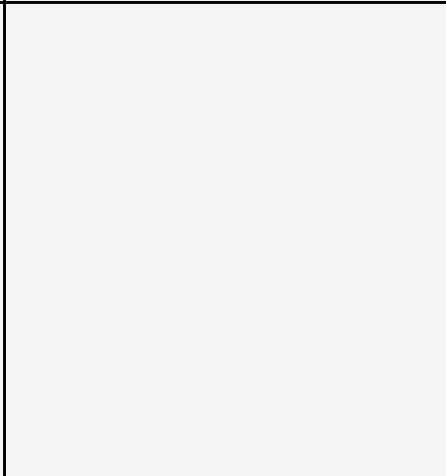
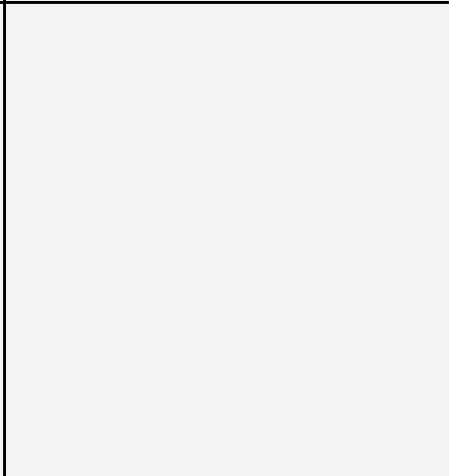
North



Ventral surface

Dorsal surface

West



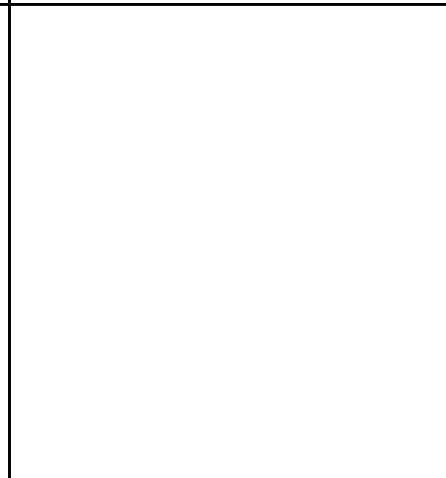
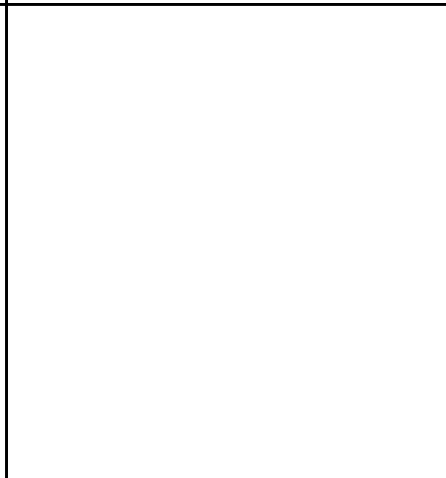
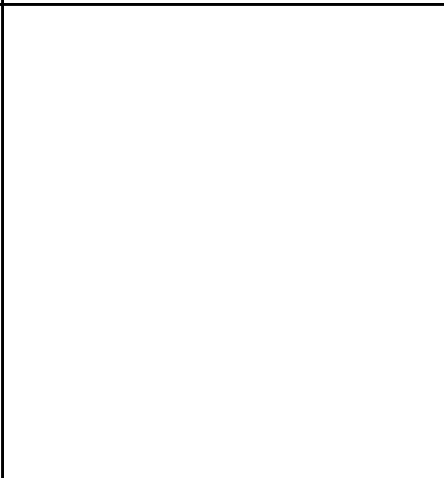
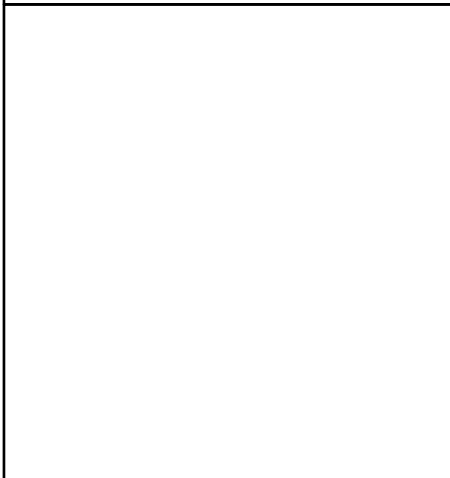
Site ID: OMPS-IF24






Detail

Detail

South



Detail	Detail	South	
			

Site ID: OMPS-IF26

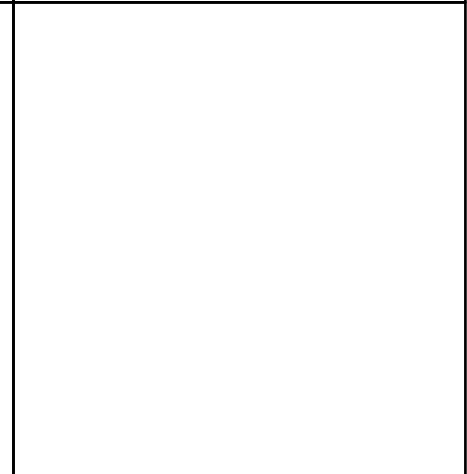
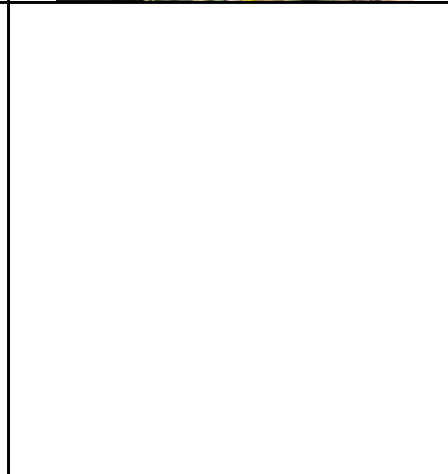
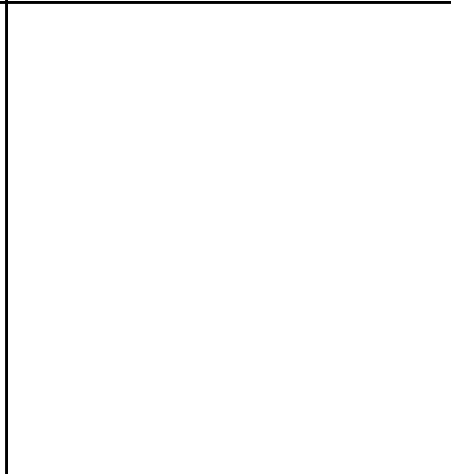
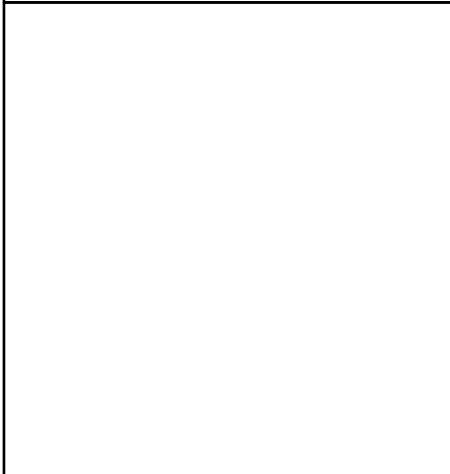


Detail

Detail

Detail

East



Detail



Detail



Detail



West



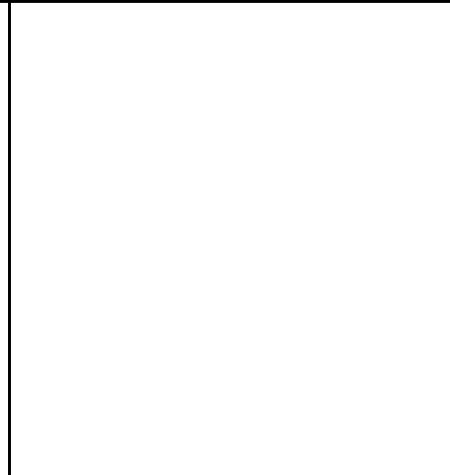
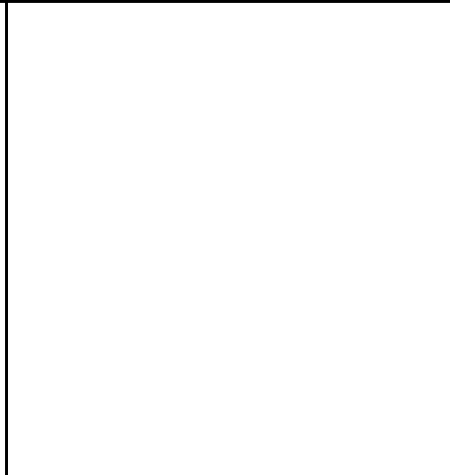
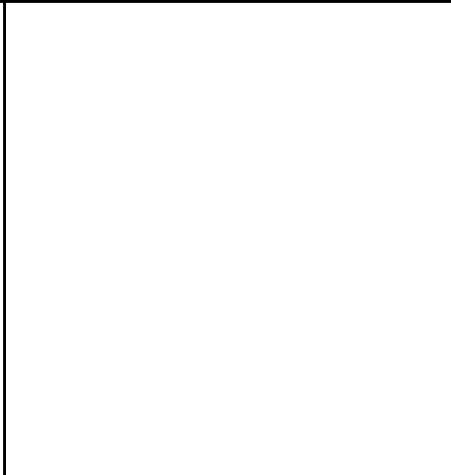
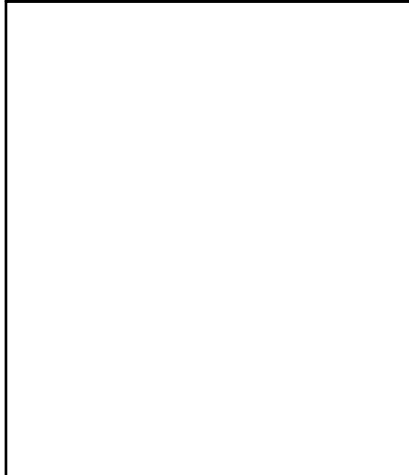
Site ID: OMPS-IF28



Detail

Detail

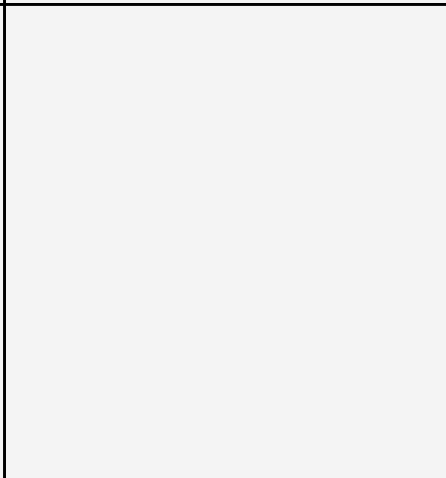
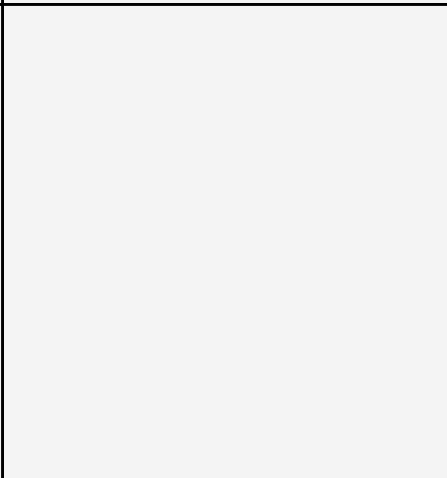
East



Detail

Detail

West

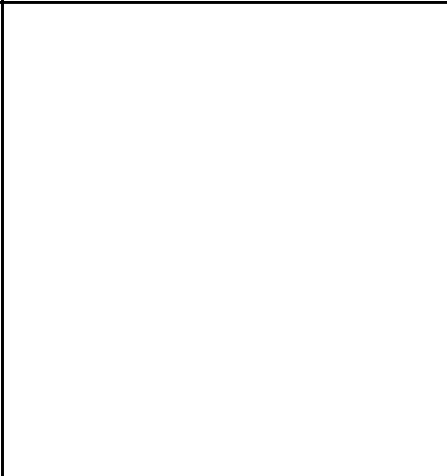
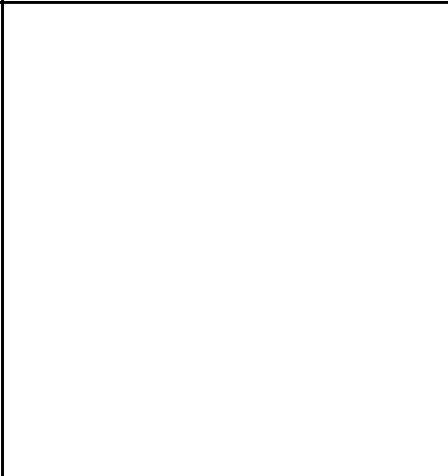
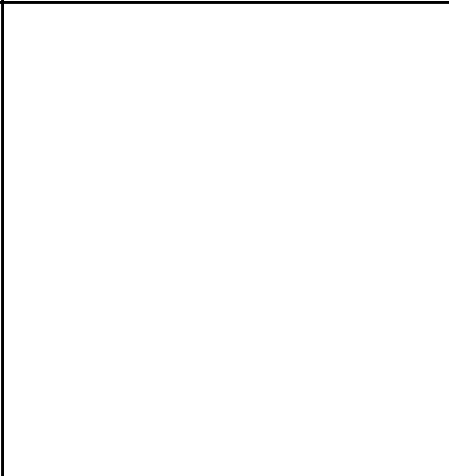
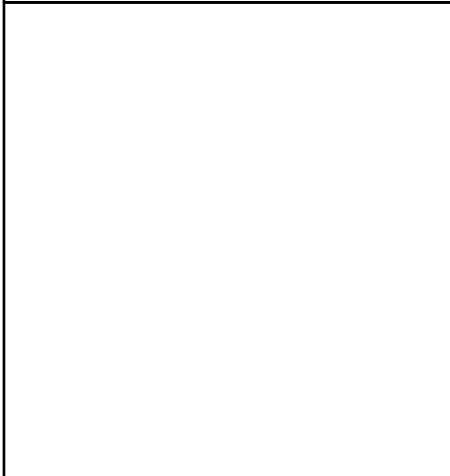


Site ID: OMPS-IF3



Detail

East



Site ID: OMPS-IF30



Cortex surface



Detail



West



Site ID: OMPS-IF31

Detail



Detail



North



Detail



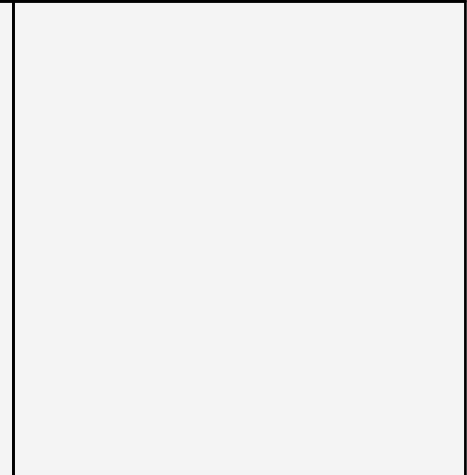
Detail



Detail



West



Site ID: OMPS-IF4

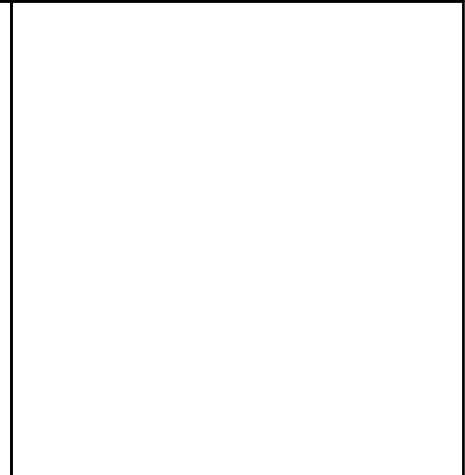
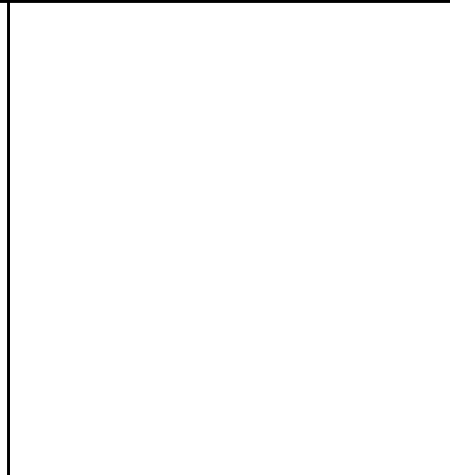
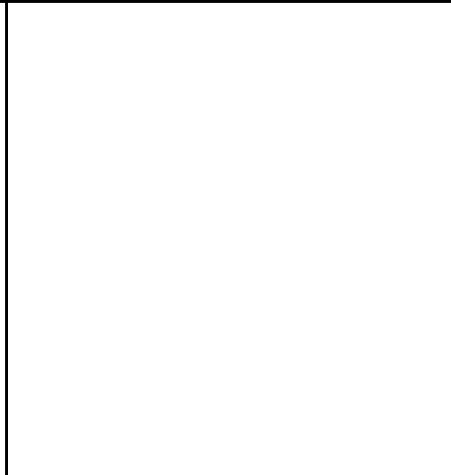
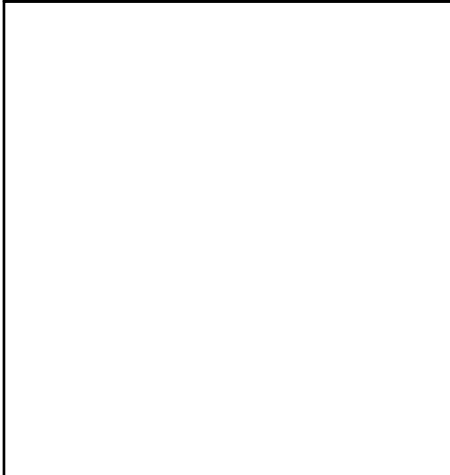


Detail

Detail

Detail

North



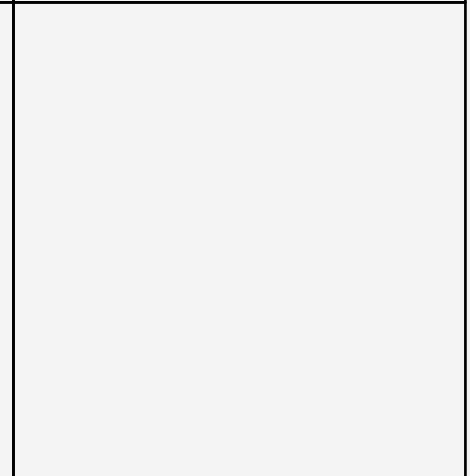
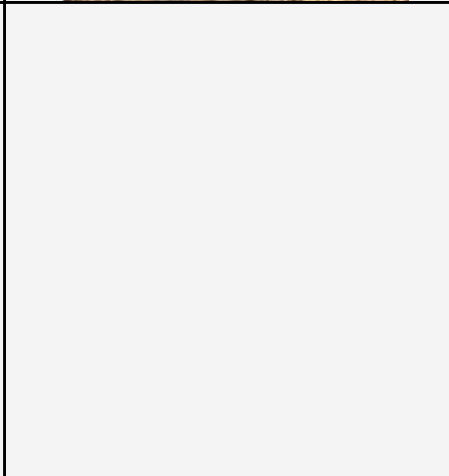
Detail



Detail



East



Site ID: OMPS-IF6



Ventral surface



Dorsal surface



North

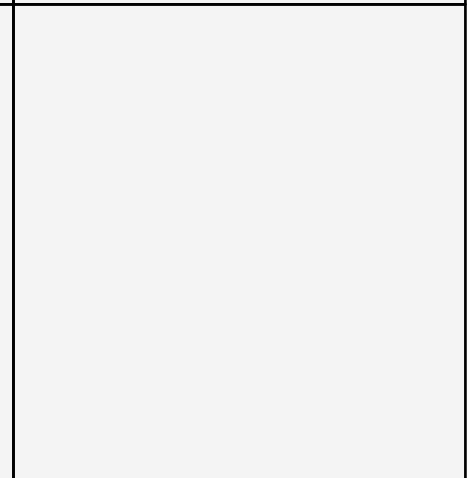
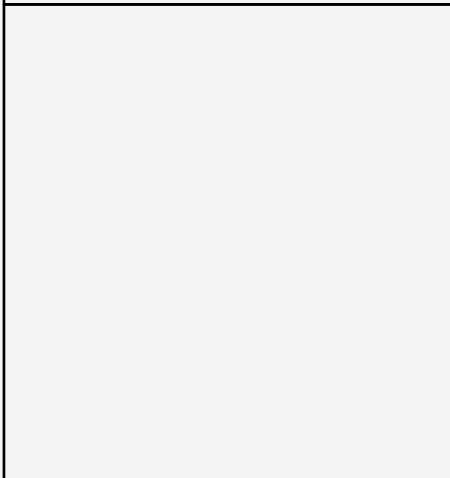


Detail

Detail

Detail

North



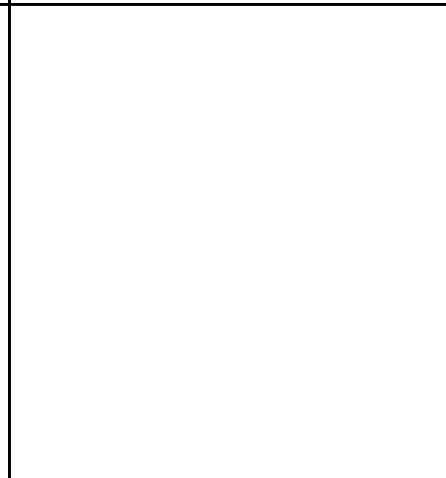
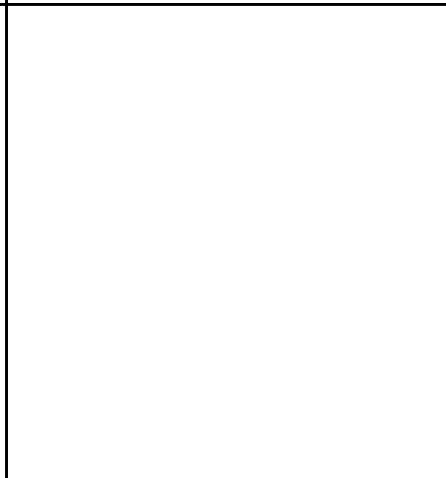
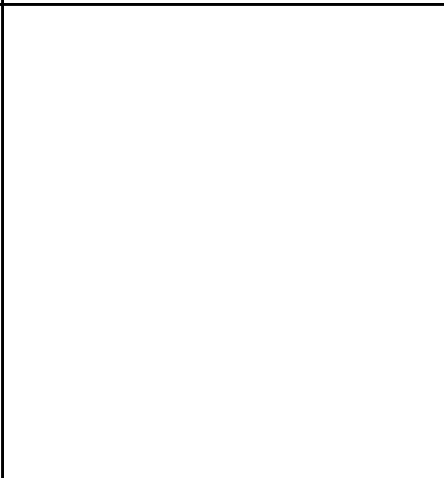
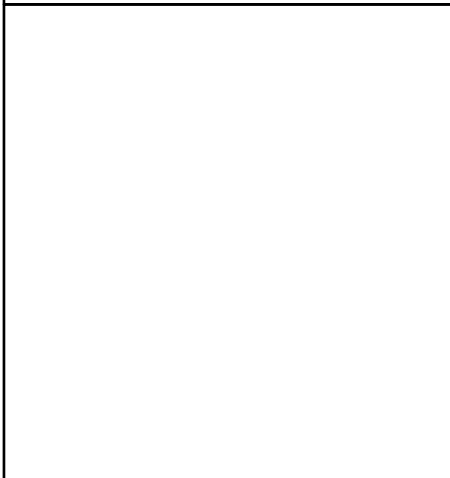
Site ID: OMPS-IF8



Detail

Detail

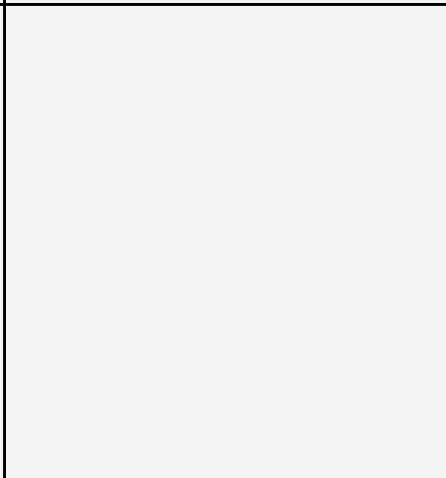
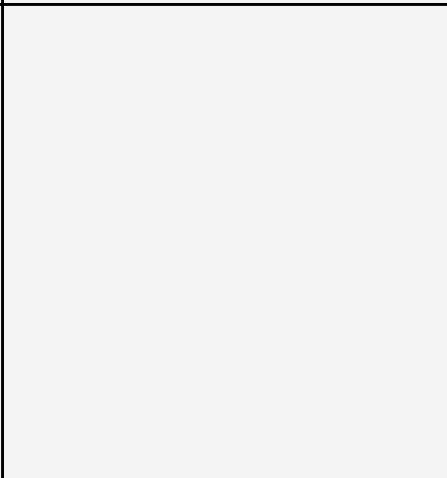
North



Detail

Detail

North west



Detail



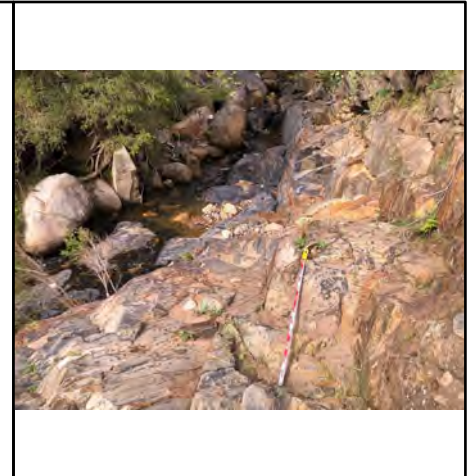
Detail



South west



South west





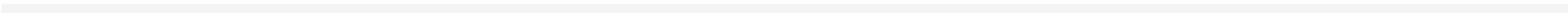
South west

Dorsal	Ventral	North	Flake removed
White chert	South west		

Detail

Detail

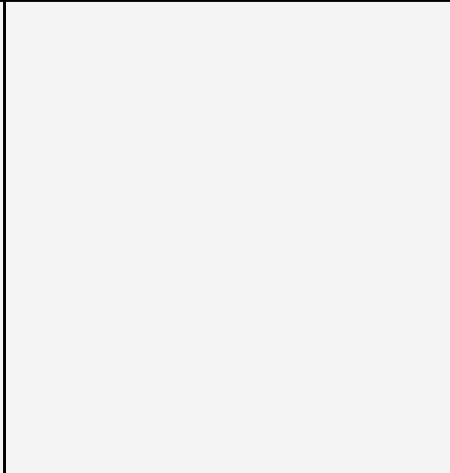
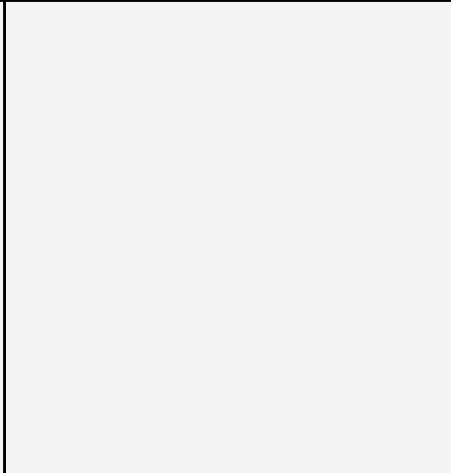
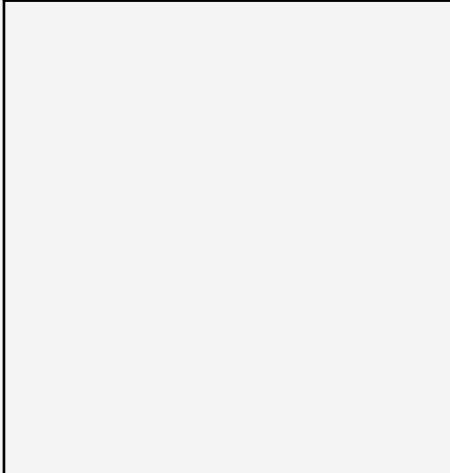
			



North

Detail

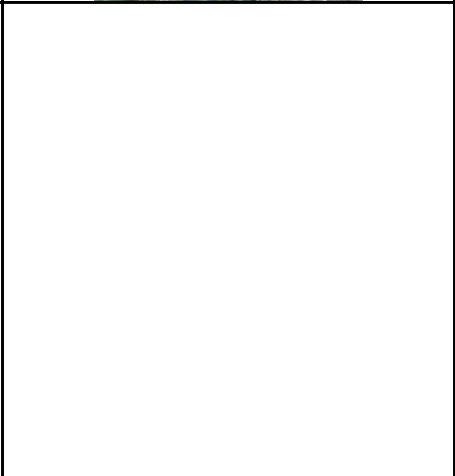
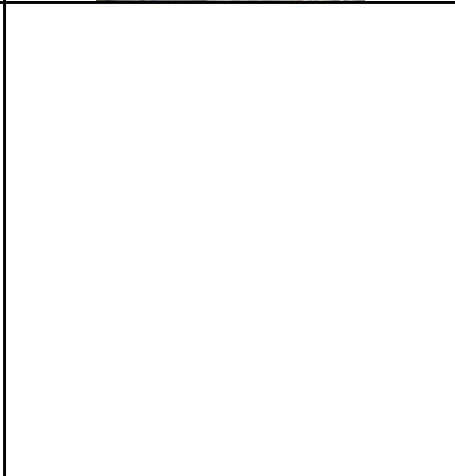
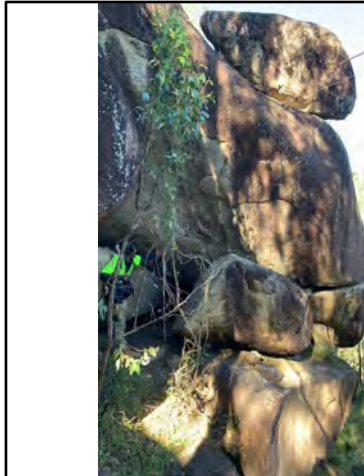
Detail






Cave opening

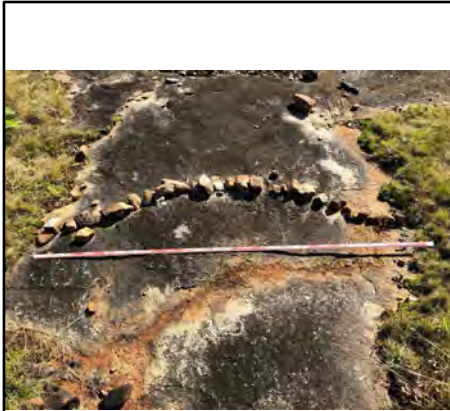
Detail

Cave opening



North	Overhang	South	
			

Detail



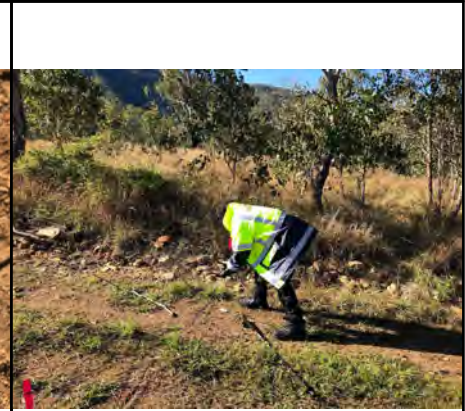
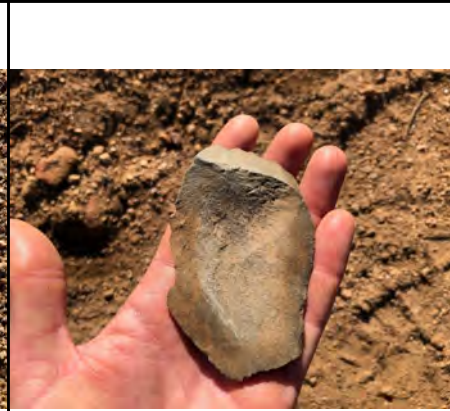
Detail



West



South



East




Detail

Detail

South

Site ID: OMPS-SA1



Dorsal surface	Ventral surface	North	
			

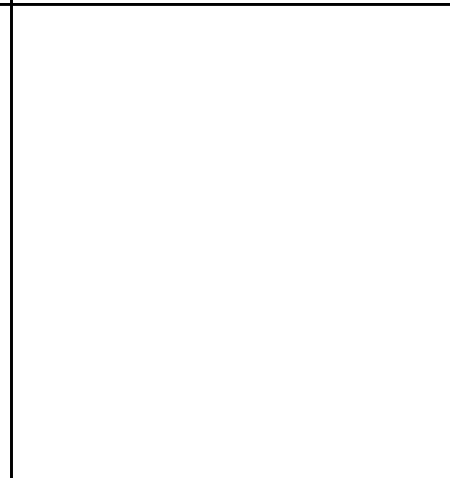
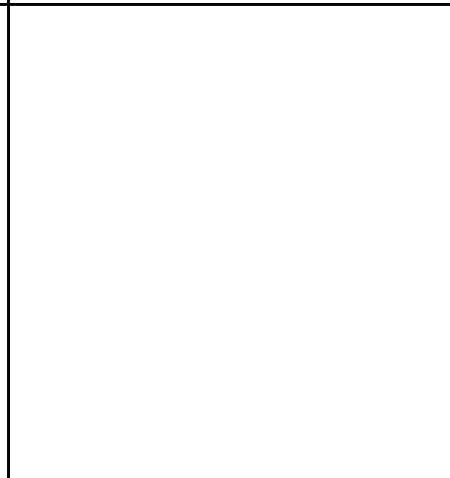
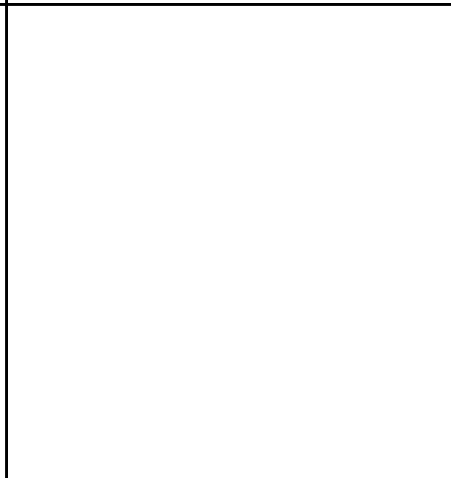
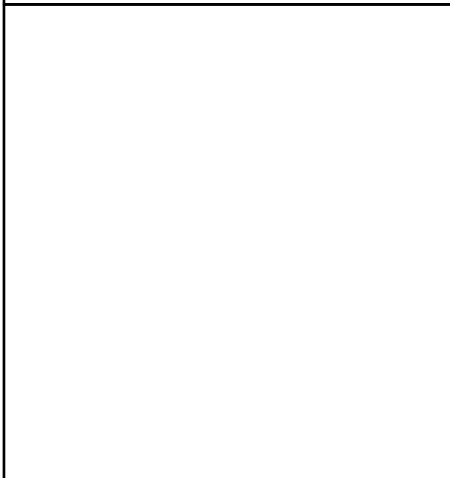
Site ID: OMPS-SA2



East

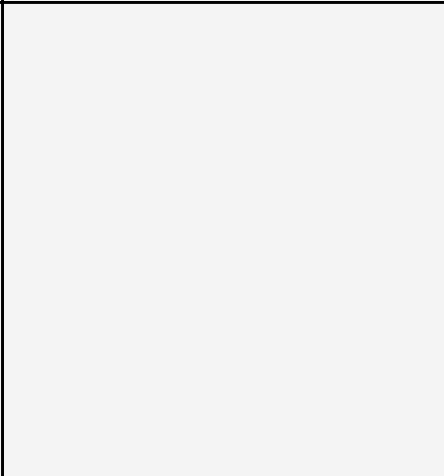
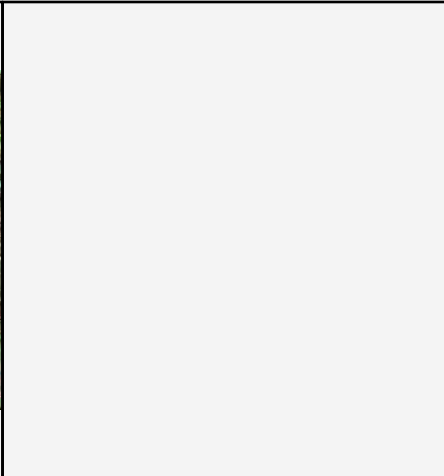
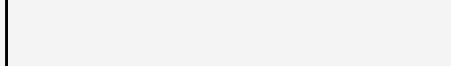
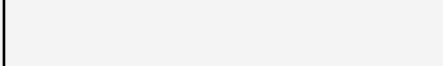
South

West



South

South



Site ID: OMPS-SA4



Detail

West

North

South



Site ID: OMPS-SA5





South



South



Site ID: OMPS-SA6



East

Detail

North

South



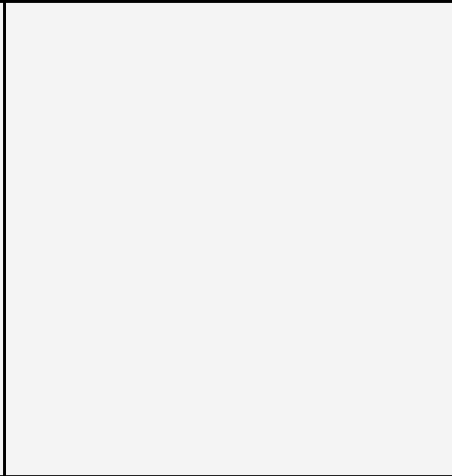
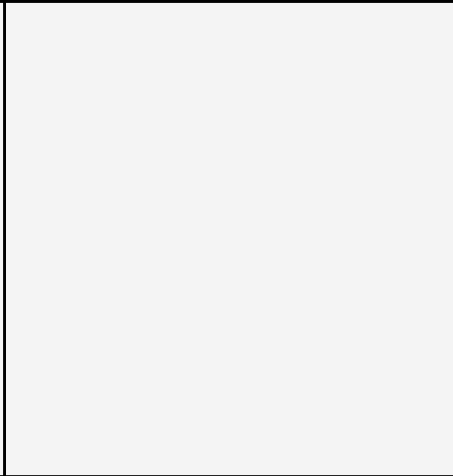
Detail



Detail



West



Site ID: OMPS-ST10



South



South



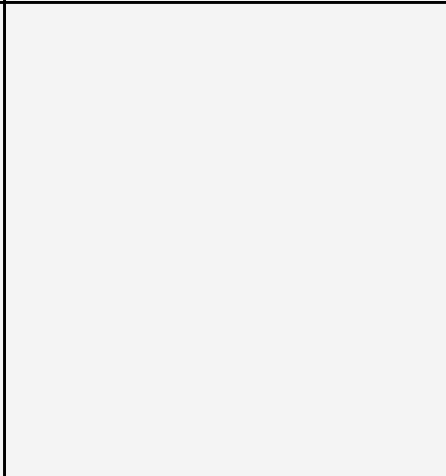
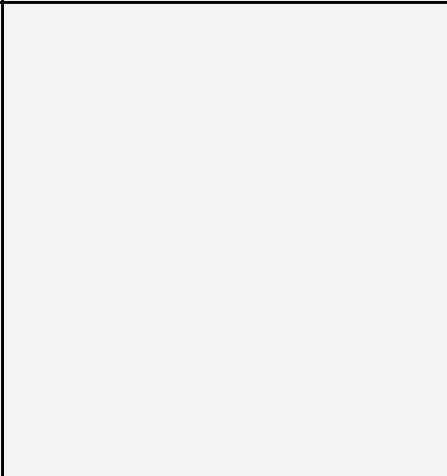
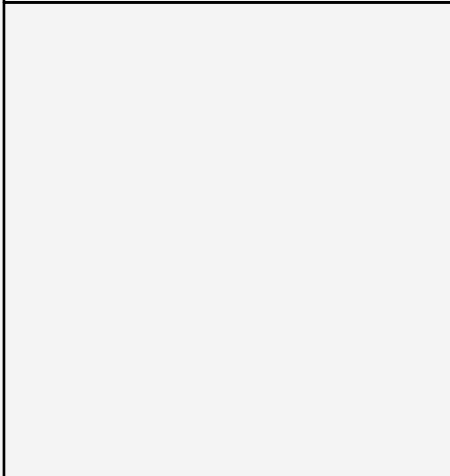
Site ID: OMPS-ST11



Detail

Detail

West



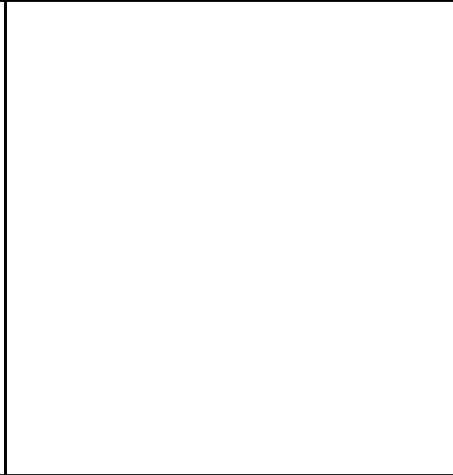
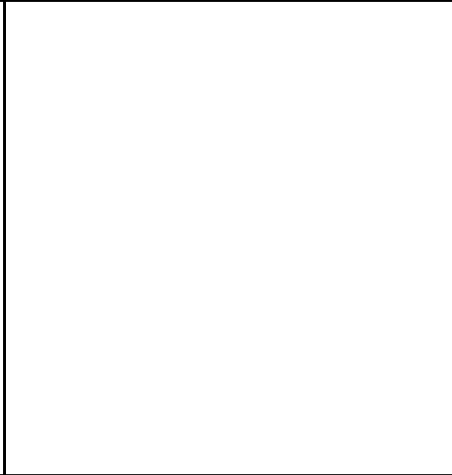
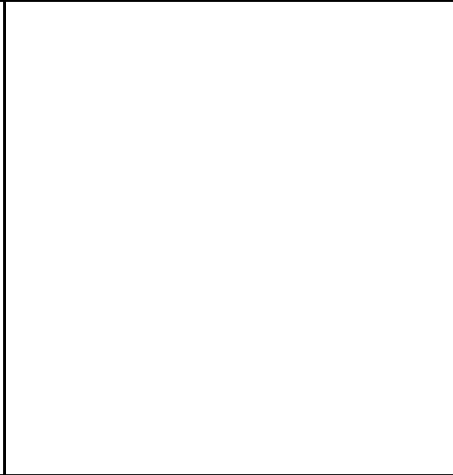
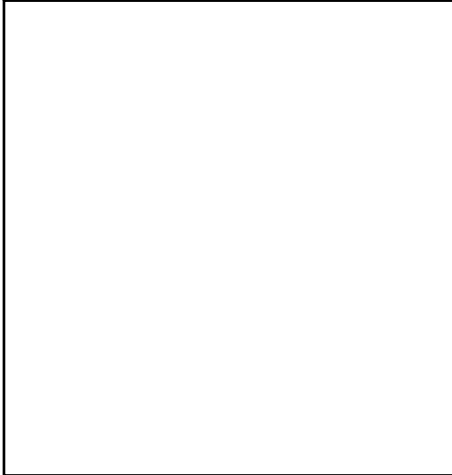
Site ID: OMPS-ST11



Detail

East

East



North



North



South



South



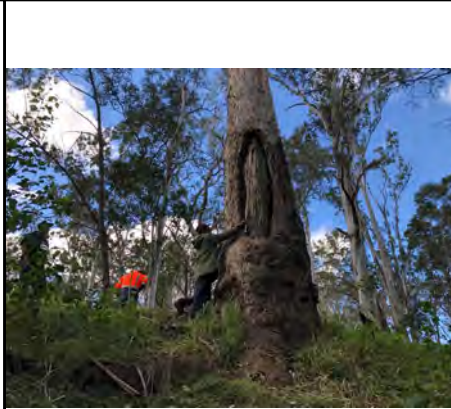
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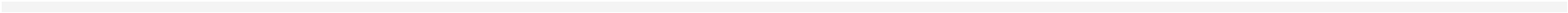
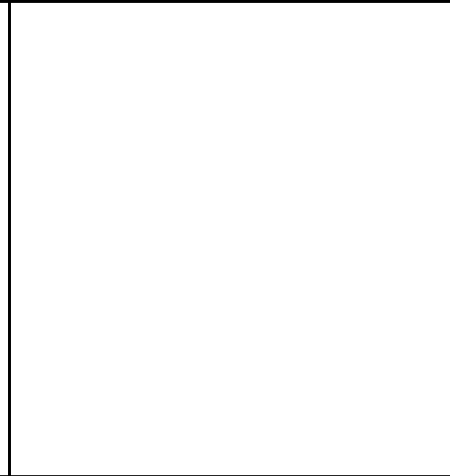
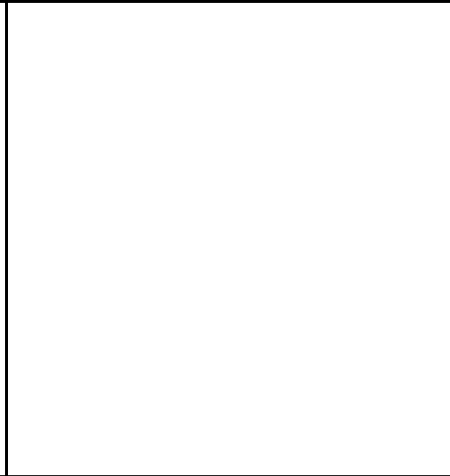
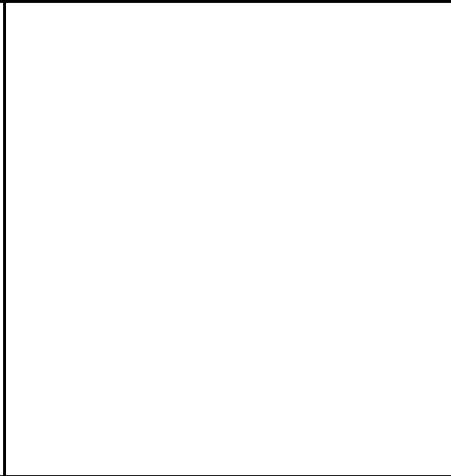
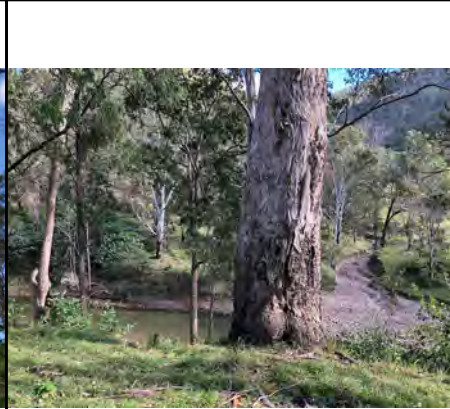
East









East



South



GPS	Scarred tree	North	North
			
			
East	North		

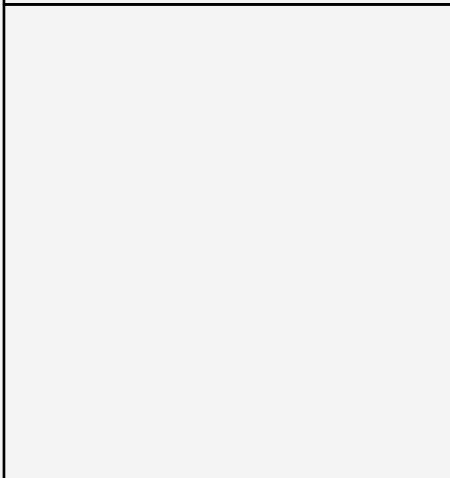
Site ID: OMPS-ST14



South west

South east

South

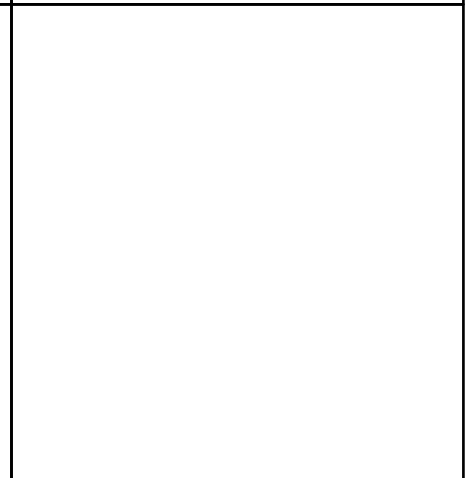
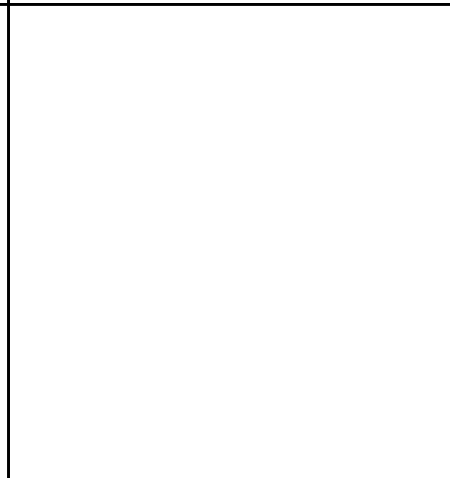
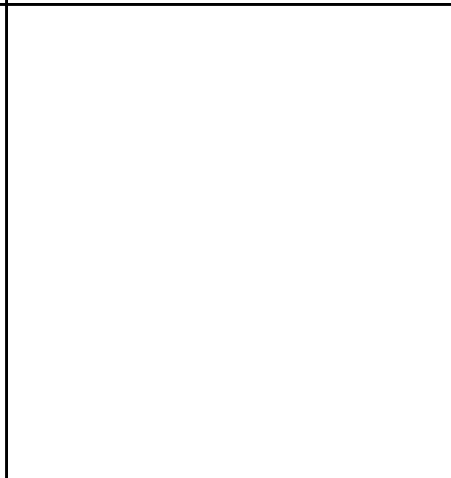
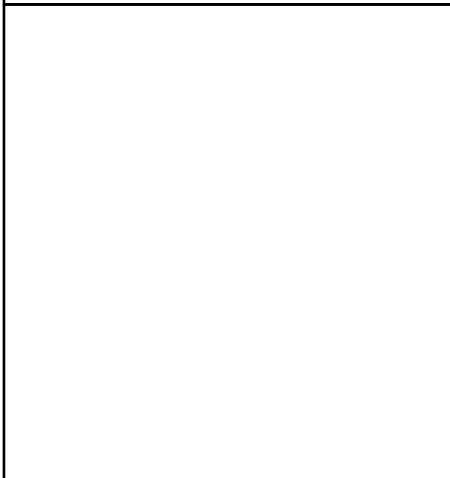


North

North

Detail

South



East



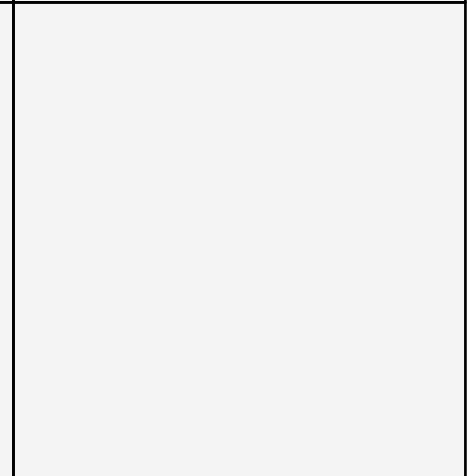
East



East



East



Site ID: OMPS-ST18

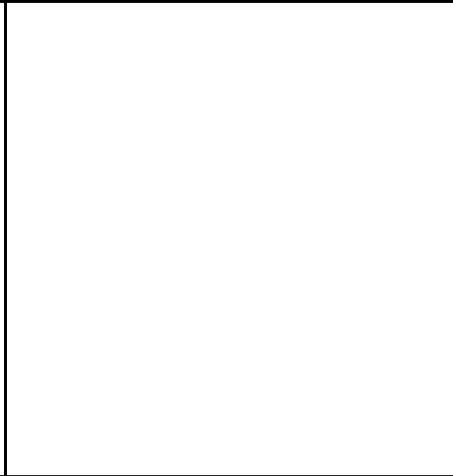
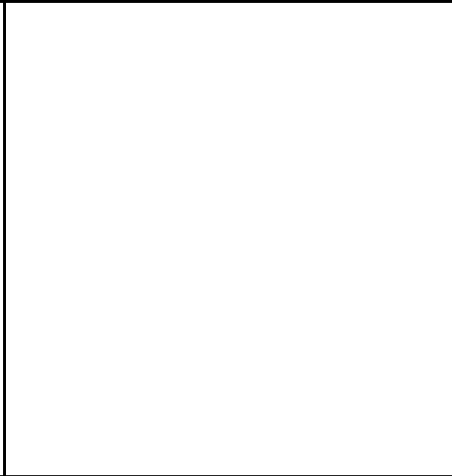
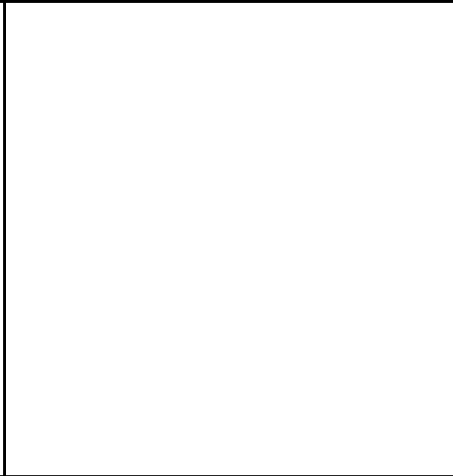
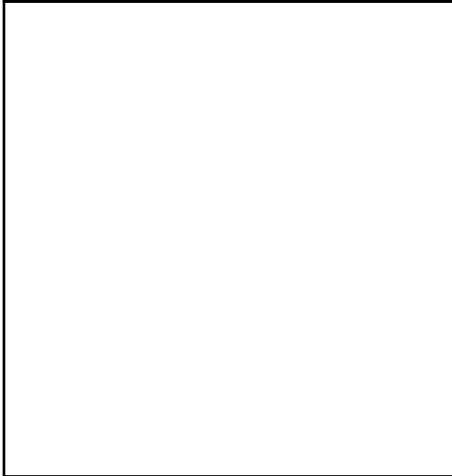
South






South



Detail



Detail	North	North	
			

Site ID: OMPS-ST2




North west



North west



Scar 2



Scar 1



Scar 3



North



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North



Detail



Detail

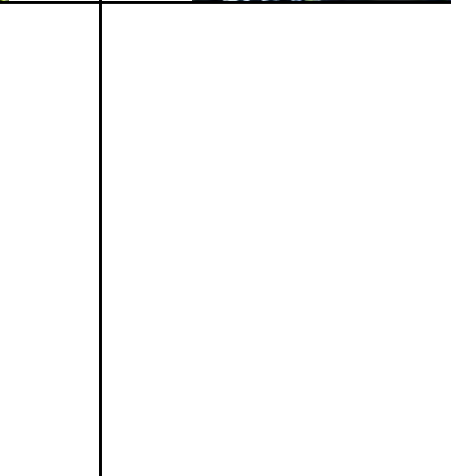


Detail



Detail

Detail



North



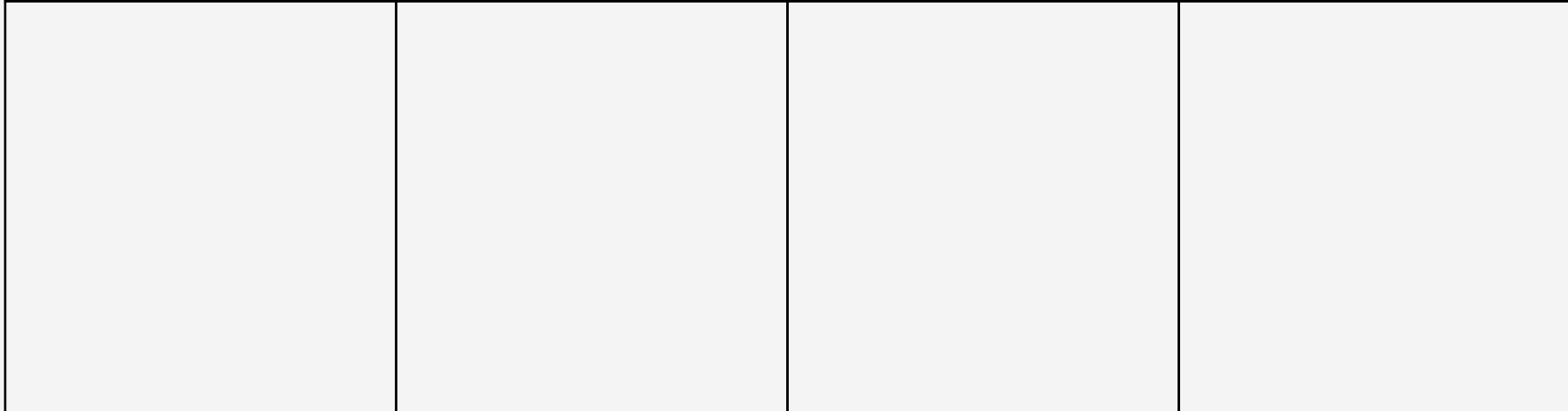
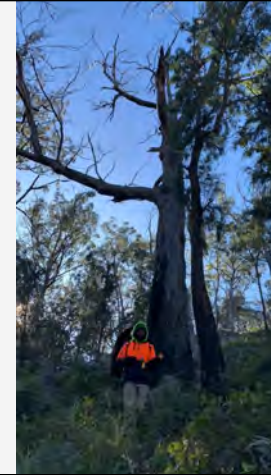
North



Detail



North





Site ID: OMPS-ST23



Scar south

South



Site ID: OMPS-ST24



South

West






Site ID: OMPS-ST3

Scarred tree

West

West

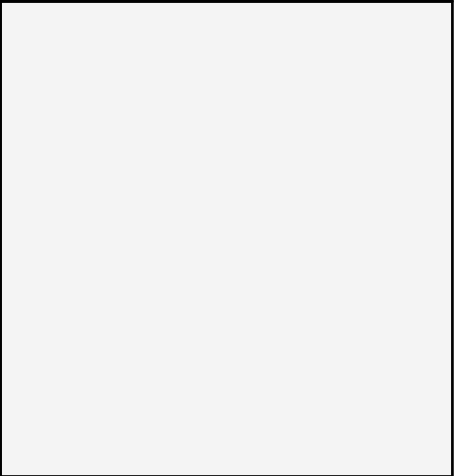
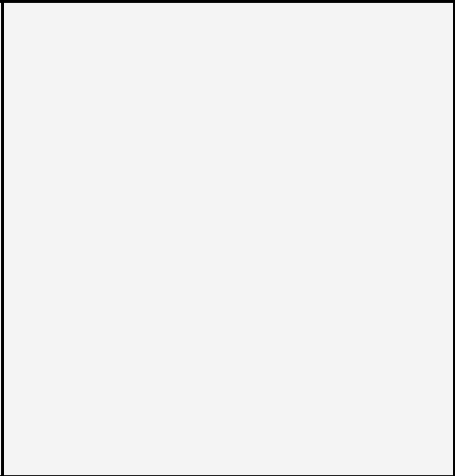
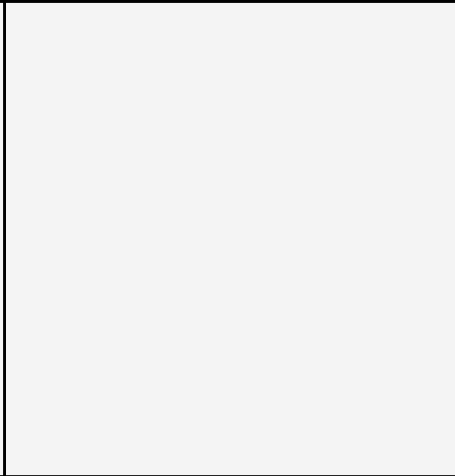
			

Scarred tree east

Detailed

Scar width

East



Site ID: OMPS-ST5



Scarred tree



Scarred tree



South

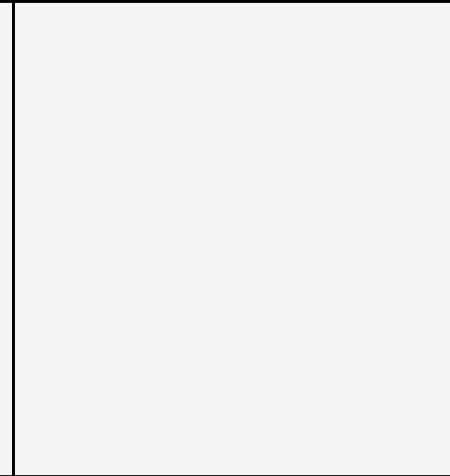
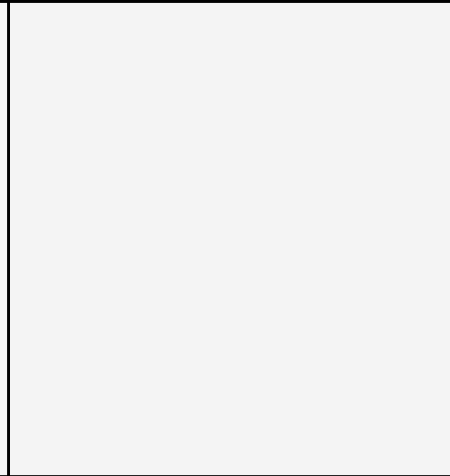
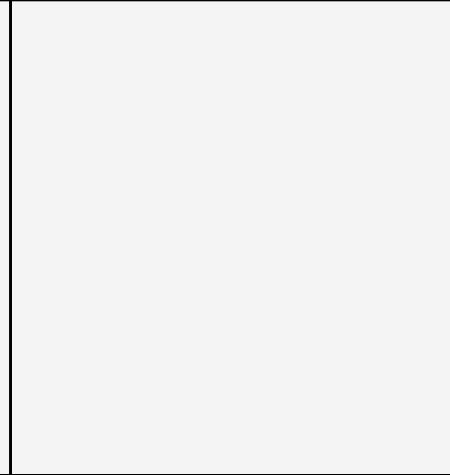


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South



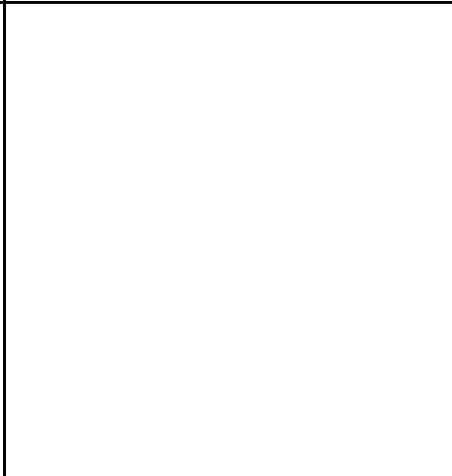
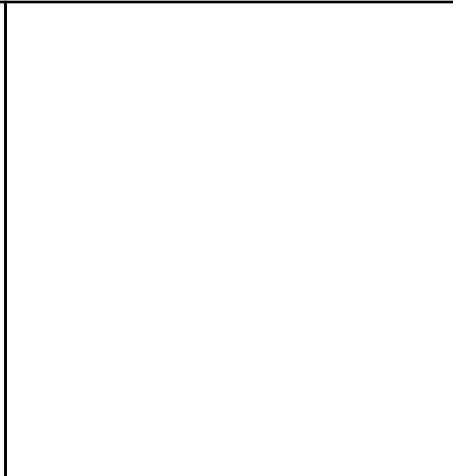
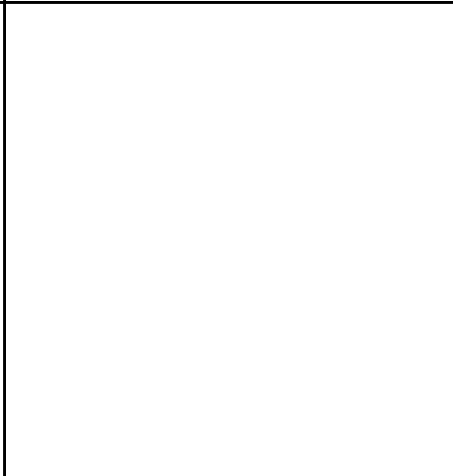
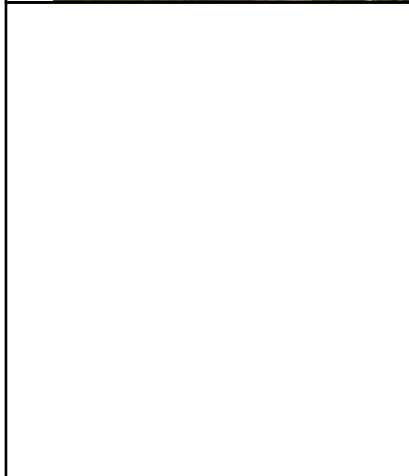
South



Site ID: OMPS-ST7

Scarred tree

East





South



South



Site ID: OMPS-ST9



West



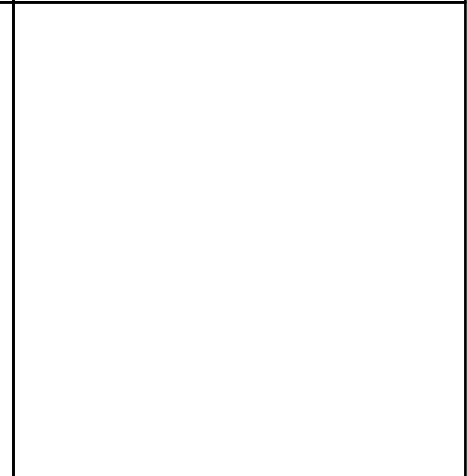
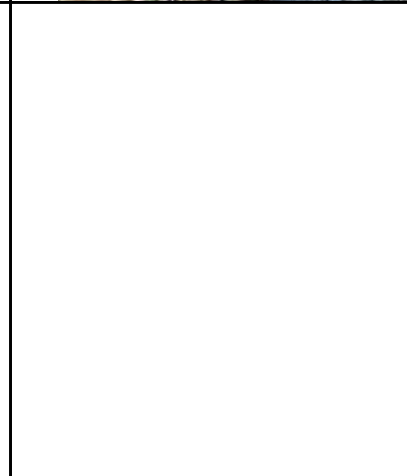
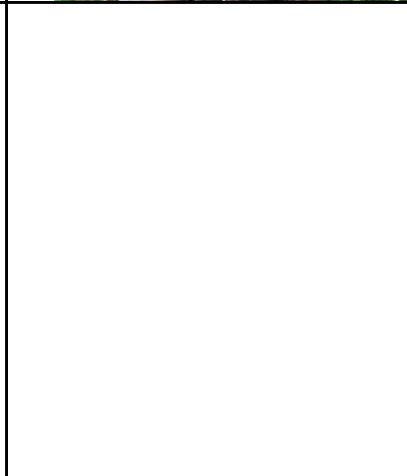
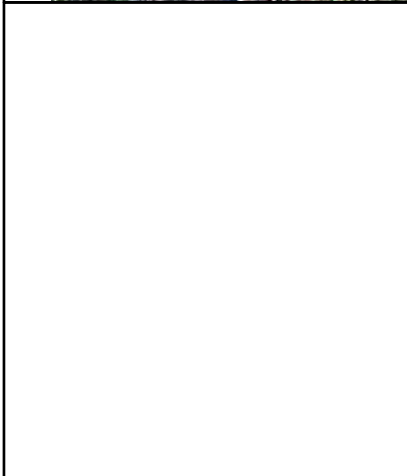
West



Detail



South west





Site ID: OMPS PAD1 (NOT SITE)



North east

East

Site ID: OMPST14-26



GPS

Detail

Detail

North



Site ID: OMPST15-1



GPS



Worked surface



Underside



West



Site ID: OMPST15-2

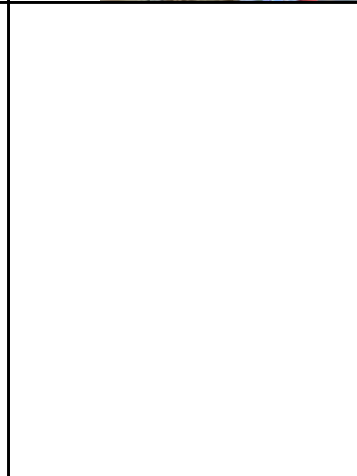
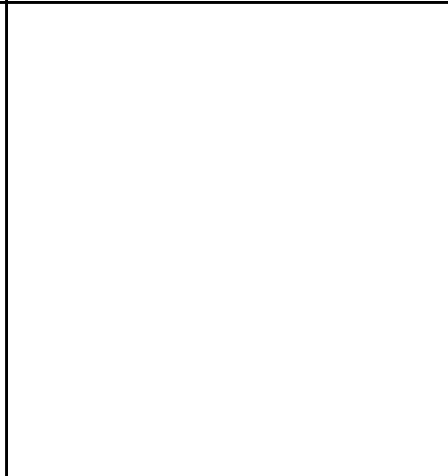
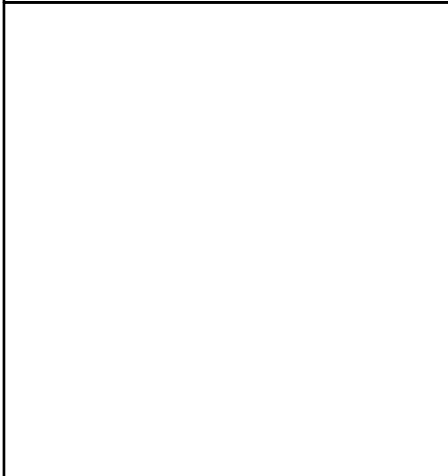


GPS

Ventral surface

Dorsal surface

North



Site ID: OMPST15-3



GPS

Scarred tree

East



Site ID: OMPST15-4



GPS

Ventral surface

Dorsal surface

West



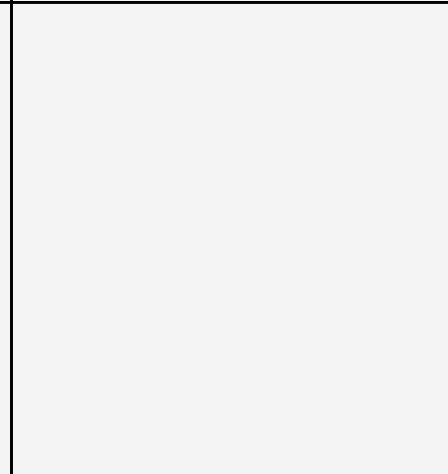
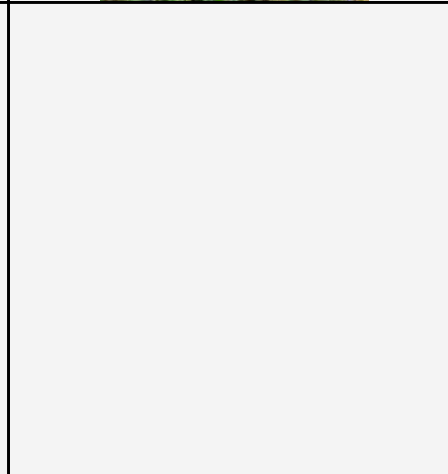
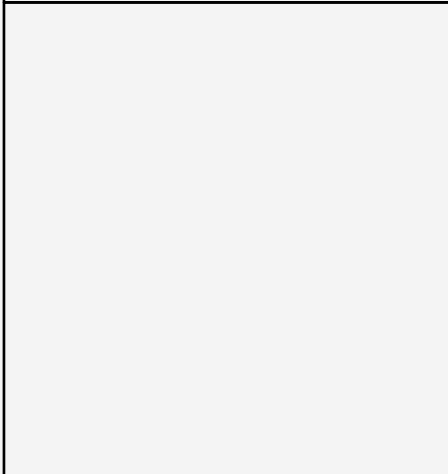
Site ID: OMPST15-5



GPS

Scarred tree

North



Site ID: OMPST15-6

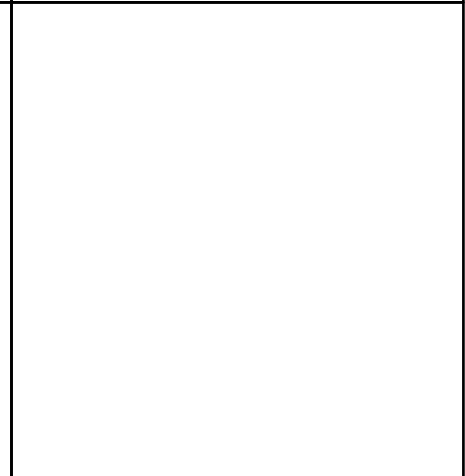
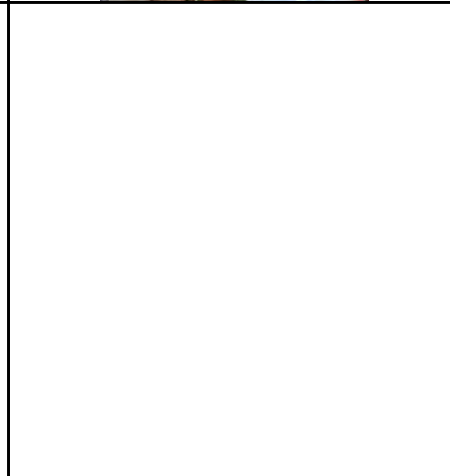
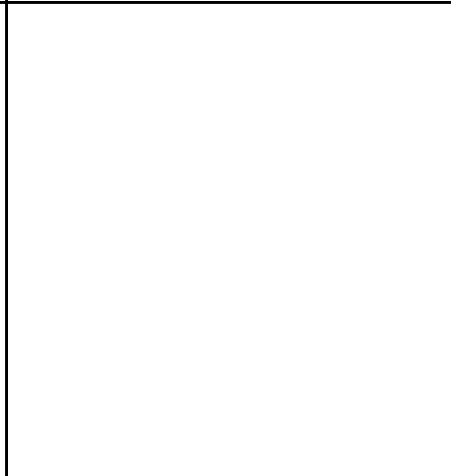
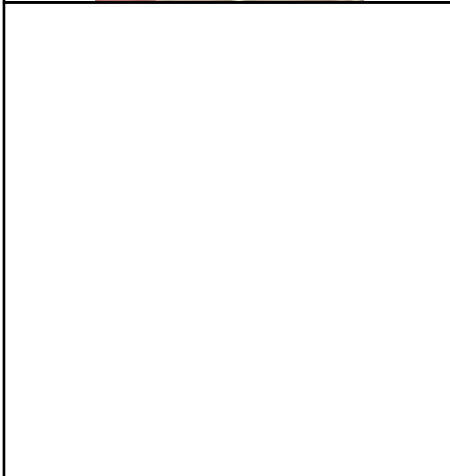
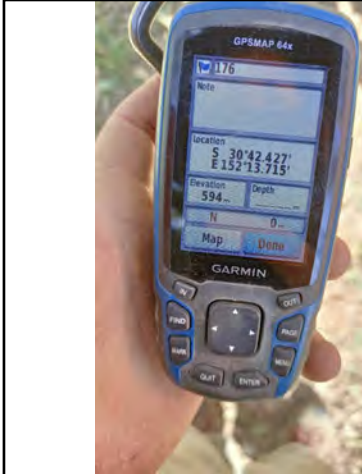


GPS

Ventral surface

Dorsal surface

North



Site ID: OMPST15-7



GPS



Detail



Detail



Detail



West

Site ID: OMPST16-1



GPS

Dorsal surface

Ventral surface

West



Site ID: OMPST16-10



GPS

Ventral surfaces

Dorsal surfaces

North



Site ID: OMPST16-11







GPS

Detail

Detail

West





Site ID: OMPST16-12



GPS	Dorsal surface	Ventral surface	West

Site ID: OMPST16-13



GPS	Dorsal surface	Ventral surface	South
			

GPS



Detail



Detail



East



Site ID: OMPST16-15

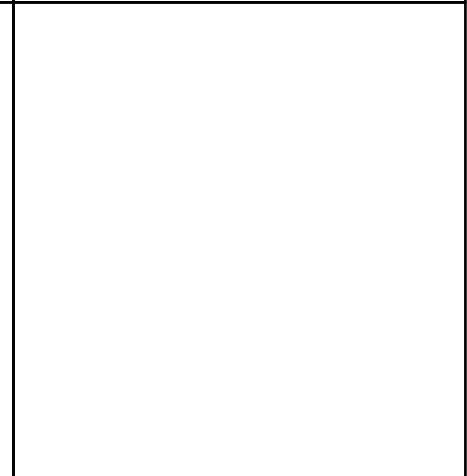
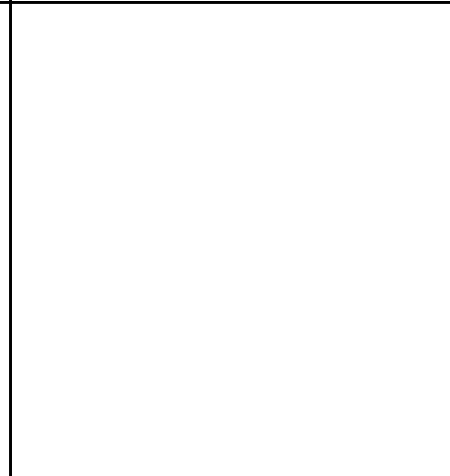
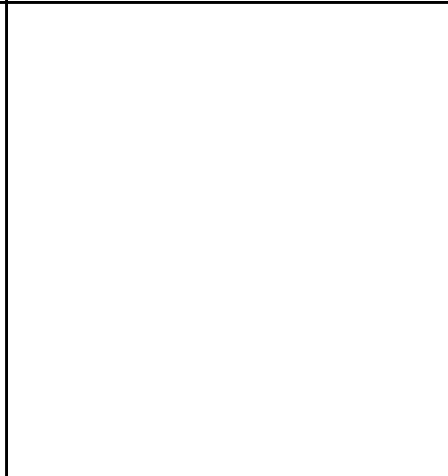
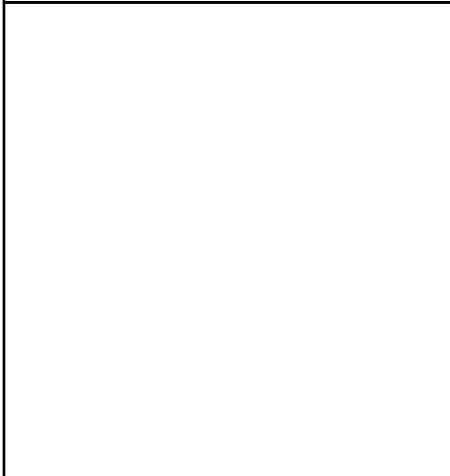
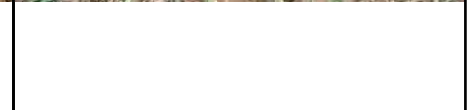
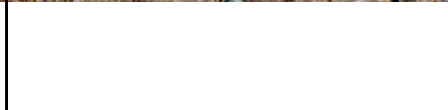


GPS

Dorsal surface

Ventral surface

West



GPS



Detail



Detail



North



Site ID: OMPST16-2



GPS

Dorsal surface

Ventral surface

West



Site ID: OMPST16-3



GPS



Detail



Detail



West



GPS



Chert flake



Chert flake



Chert core



Basalt flake

Chert flake



Artifact scatter



GPS



Dorsal surface



Ventral surface



North



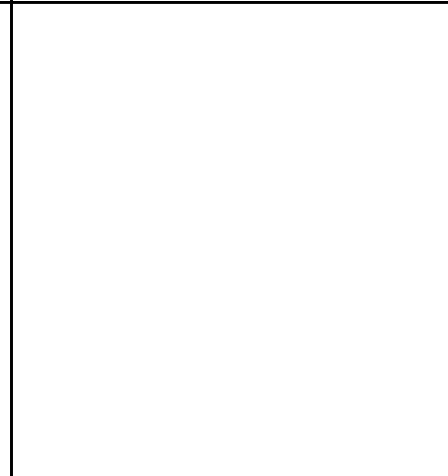
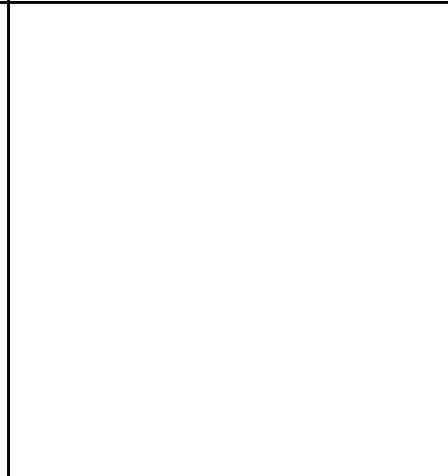
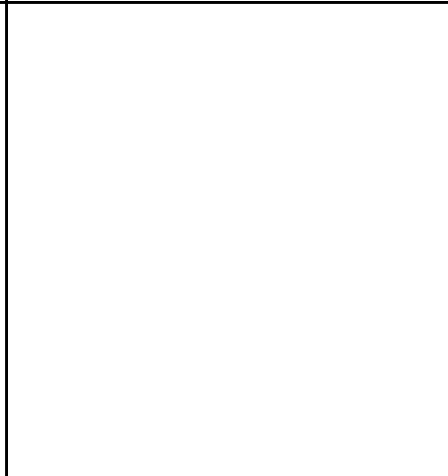
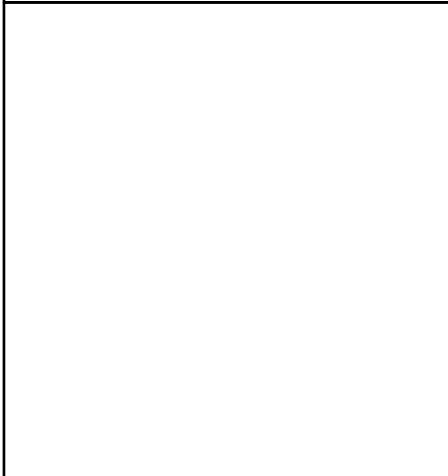
Site ID: OMPST16-6



GPS

Ventral surface

Dorsal surface



Site ID: OMPST16-7



GPS



Detail



Detail



West



Site ID: OMPST16-8

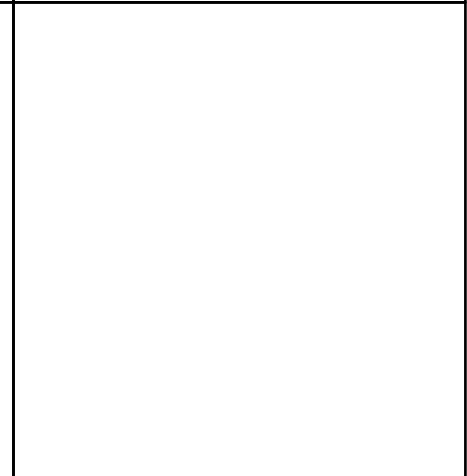
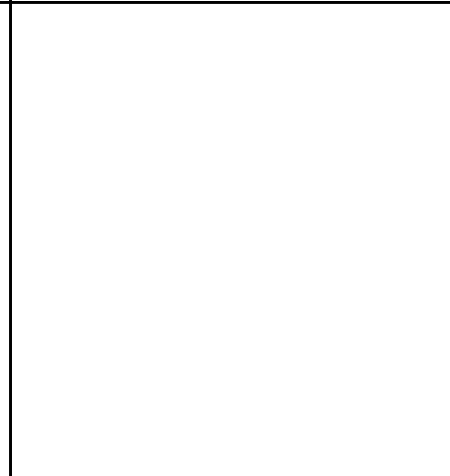
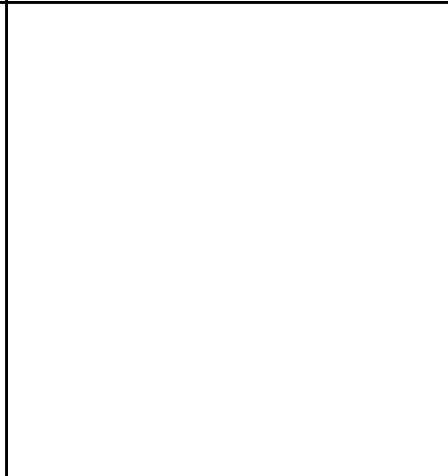
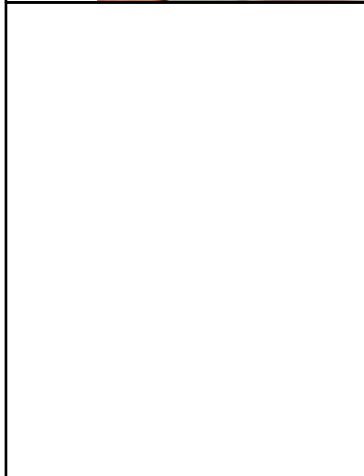


GPS

Dorsal surface

Ventral surface

East



Site ID: OMPST16-9



GPS



Dorsal surface



Ventral surface



North



Site ID: OS X







Detail

North

West

Artefact relocation - UR - Detail

 A close-up photograph of an archaeological site. The ground is dark and appears to be a mix of soil and rock. Several grey, angular stones are scattered across the surface. A color calibration chart with various colored squares and a ruler is placed in the foreground for scale.	 A person wearing an orange jacket and dark pants stands on a dirt path in a wooded area. The path is surrounded by trees and undergrowth. The person appears to be looking at something on the ground.	 A wide-angle photograph of a dirt path winding through a forest. The path is made of dirt and has some tire tracks. The trees are tall and thin, and the ground is covered with grass and small plants.	 A person wearing an orange jacket and dark pants is kneeling on a dirt path in a wooded area. A utility vehicle, possibly a golf cart or a small truck, is parked on the path nearby. The person appears to be working on the ground.

F.4 Test pit information

Table F.3 Summary of excavated test pits

Test pit #	Easting	Northing	Landform	Distance from the Macleay River (m)	Depth of test pit (cm below surface)	Number of artefacts (n)	Extrapolated artefact count (per m ²)
T1P1	418943	6591460	Hillslope	242	55	0	0
T1P2	418966	6591451	Terrace	271	60	0	0
T1P3	418980	6591456	Terrace	280	50	0	0
T1P4	418975	6591433	Hillslope	291	30	0	0
T1P5	418996	6591409	Hillslope	325	10	0	0
T1P6	419006	6591384	Hillslope	351	10	0	0
T2CP1	419274	6591716	Hillslope	397	25	0	0
T2P1	419287	6591745	Hillslope	402	25	0	0
T2P2	419304	6591759	Hillslope	414	20	0	0
T2P3	419308	6591773	Hillslope	412	10	0	0
T2P4	419326	6591742	Hillslope	446	10	0	0
T2P5	419352	6591720	Hillslope	483	30	0	0
T2P6	419373	6591681	Hillslope	519	10	0	0
T3P1	419442	6591932	Spurcrest	491	30	0	0
T3P2	419468	6591965	Spurslope	511	40	0	0
T3P3	419480	6591943	Spurslope	530	10	0	0
T3P4	419510	6591928	Spurslope	568	30	0	0
T4CP1	419853	6592177	Spurcrest	957	20	0	0
T4CP2	419710	6592398	Spurcrest	795	30	0	0
T4P1	420119	6592028	Spurcrest	1257	80	2	8
T4P2	419770	6592337	Spurcrest	865	60	6	24
T4P3	419732	6592384	Spurcrest	821	30	0	0
T4P4	419695	6592410	Spurcrest	778	50	0	0
T4P5	419330	6592888	Hillslope	248	20	0	0
T4P6	419341	6592824	Hillslope	318	20	0	0
T4P7	419384	6592787	Hillslope	381	30	0	0
T4P8	419312	6592852	Hillslope	272	30	0	0
T4P9	420083	6592018	Creepline	1216	40	0	0
T4P10	420052	6592014	Hillslope	1180	25	0	0
T4P11	420044	6592087	Spurcrest	1170	30	0	0

Table F.3 Summary of excavated test pits

Test pit #	Easting	Northing	Landform	Distance from the Macleay River (m)	Depth of test pit (cm below surface)	Number of artefacts (n)	Extrapolated artefact count (per m ²)
T4P12	419938	6592141	Spurcrest	1050	50	0	0
T4P13	419891	6592167	Spurcrest	1000	35	23	92
T4P14	419881	6592219	Spurslope	997	20	0	0
T4P15	419843	6592259	Hillslope	957	10	4	16
T4P16	419810	6592308	Spurcrest	915	20	10	40
T5P1	419789	6593182	Spurcrest	269	50	16	64
T5P2	419830	6593153	Spurcrest	323	50	7	28
T5P3	419859	6593133	Spurcrest	362	40	0	0
T5P4	419900	6593105	Spurcrest	415	45	1	4
T5P5	419935	6593085	Creekline	459	40	3	12
T5P6	419952	6593054	Spurcrest	500	30	0	0
T5P7	419981	6593028	Spurcrest	545	30	0	0
T5P8	420019	6593003	Spurcrest	595	40	15	60
T5P9	420049	6592970	Spurcrest	648	30	0	0
T6CP1	420045	6593290	Spurcrest	360	25	0	0
T6P1	419971	6593356	Spurcrest	253	75	14	56
T6P2	420009	6593302	Spurcrest	329	70	1	4
T6P3	420033	6593263	Spurcrest	382	70	0	0
T6P4	420065	6593228	Spurcrest	436	50	0	0
T6P5	420079	6593184	Spurcrest	489	30	0	0
T7CP1	420421	6593635	Ridge	337	30	6	24
T7P1	420418	6593652	Ridge	322	65	2,014	8,056
T7P2	420398	6593611	Ridge	336	40	0	0
T7P3	420388	6593525	Ridge	395	20	59	236
T7P4	420394	6593488	Ridge	431	50	0	0
T7P5	420525	6593312	Ridge	684	50	0	0
T7P7	420601	6593221	Ridge	821	30	2	8
T7P8	420507	6593334	Ridge	650	40	0	0
T8P1	420558	6593906	Hillcrest	280	35	0	0
T8P2	420598	6593858	Hillcrest	347	40	4	16

Table F.3 Summary of excavated test pits

Test pit #	Easting	Northing	Landform	Distance from the Macleay River (m)	Depth of test pit (cm below surface)	Number of artefacts (n)	Extrapolated artefact count (per m ²)
T9CP1	421026	6594115	Hillslope	431	45	0	0
T9CP2	421019	6594103	Hillslope	433	45	0	0
T9P1	421130	6593809	Hillslope	781	55	0	0
T9P2	421118	6593854	Hillslope	729	60	9	36
T9P3	421107	6593900	Hillslope	679	40	0	0
T9P4	421052	6593918	Hillslope	624	45	12	48
T9P5	420996	6593933	Hillslope	575	20	0	0
T9P6	421000	6593983	Hillslope	526	40	0	0
T11P1	421573	6594626	Spurcrest	306	45	3	12
T11P2	421589	6594601	Spurcrest	334	50	1	4
T12P1	421863	6594679	Spurcrest	562	45	0	0
T12P2	421873	6594730	Spurcrest	532	40	0	0
T12P3	421865	6594848	Spurcrest	415	60	6	24
T13P1	422545	6594835	Hillslope	1009	45	0	0
T13P2	422557	6594875	Hillslope	995	40	0	0
T13P3	422559	6594912	Hillslope	974	50	0	0
T13P4	422168	6595106	Spurcrest	468	40	0	0
T13P5	422093	6595124	Spurcrest	385	50	51	204
T13P6	422022	6595147	Spurcrest	304	55	47	188
T14P1	422496	6595162	Spurcrest	780	35	0	0
T14P2	422417	6595202	Spurcrest	677	40	3	12
T14P3	422387	6595289	Spurcrest	597	30	2	8
T15P1	422453	6595228	Spurcrest	698	55	37	148
T15P2	422456	6595603	Spurcrest	442	50	13	52
T15P3	422413	6595647	Spurcrest	372	40	12	48
T16P1	422522	6595885	Spurslope	308	45	0	0
T16P2	422505	6595905	Spurslope	279	30	0	0
T16P3	422486	6595920	Spurslope	252	30	0	0
T17CP1	422824	6596457	Spurslope	521	35	0	0
T17P1	422667	6596397	Spurslope	381	40	0	0

Table F.3 Summary of excavated test pits

Test pit #	Easting	Northing	Landform	Distance from the Macleay River (m)	Depth of test pit (cm below surface)	Number of artefacts (n)	Extrapolated artefact count (per m ²)
T17P2	422672	6596396	Spurslope	386	30	0	0
T17P3	422723	6596442	Spurslope	415	40	0	0
T17P4	422807	6596350	Spurcrest	549	40	0	0
T17P5	422760	6596397	Spurslope	476	30	0	0
T17P6	422850	6596308	Spurcrest	613	40	0	0
T18P1	423098	6596648	Spurcrest	787	40	0	0
T18P2	423046	6596668	Spurcrest	726	40	0	0
T18P3	422986	6596675	Spurcrest	656	40	2	8
T18P4	422955	6596702	Spurcrest	616	30	0	0
T18P5	422893	6596721	Spurcrest	542	50	0	0
T18P6	422842	6596763	Spurcrest	480	30	0	0
T19P1	423122	6597079	Spurcrest	549	50	0	0
T19P2	423078	6597117	Spurcrest	482	50	2	8
T19P3	423006	6597110	Spurslope	429	50	4	16
T19P4	422948	6597111	Spurslope	381	70	19	76
T19P5	422925	6597145	Spurslope	334	50	25	100
T19P6	422873	6597171	Spurslope	270	40	0	0
T20P1	423034	6597160	Hillslope	410	35	0	0
T20P2	423070	6597218	Hillslope	394	20	3	12
T21P1	423497	6597359	Spurslope	396	50	0	0
T21P2	423449	6597283	Spurslope	495	50	0	0
T22P1	423928	6597291	Spurslope	326	50	18	72
T22P2	423925	6597223	Spurslope	401	50	1	4
T22P3	423811	6597208	Spurslope	461	40	0	0
T23P1	424283	6597213	Spurslope	280	55	5	20
T23P2	424280	6597166	Spurslope	335	50	0	0
Total	-	-	-	-	-	2462	9848
<i>Average</i>	-	-	-	<i>531</i>	<i>39</i>	<i>25</i>	<i>85</i>

F.5 Photograph catalogue (excavation)



TP23P2 post ex



T1P1 context N



T1P1 post ex north section



T1P1 pre ex



T1P2 context N



T1P2 north section



T1P2 post ex



T1P2 pre ex



T1P3 context N



T1P3 post ex



T1P3 pre ex



T1P4 context (2)



T1P4 context



T1P4 post ex



T1P4 pre ex



T1P5 context N



T1P5 post ex



T1P5 pre ex



T1P6 context N



T1P6 post ex north section



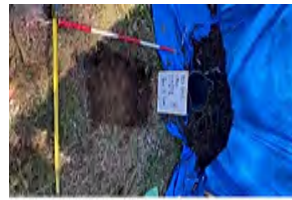
T1P6 post ex south section



T1P6 pre ex



T2CP1 context



T2CP1 post ex



T2CP1 pre ex



T2P1 context



T2P1 post ex



T2P1 pre ex



T2P2 context



T2P2 post ex



T2P2 pre ex



T2P3 context E



T2P3 context N



T2P3 post ex north section



T2P3 pre ex



T2P4 context E



T2P4 context N



T2P4 post ex



T2P4 pre ex



T2P5 context W



T2P5 north section



T2P5 post ex



T2P5 pre ex



T2P6 context E



T2P6 context N



T2P6 post ex north section



T2P6 pre ex



T3P1 context N



T3P1 post ex north section



T3P1 pre ex



T3P2 context N



T3P2 post ex north section



T3P2 post ex



T3P2 pre ex



T3P3 context N



T3P3 post ex



T3P3 pre ex



T3P4 context E



T3P4 north section



T3P4 post ex



T3P4 pre ex



T4CP1 context N



T4CP1 post ex



T4CP1 pre ex



T4CP2 context N



T4CP2 north section



T4CP2 post ex



T4CP2 pre ex



T4P1 context N



T4P1 post ex north section



T4P1 pre ex



T4P2 context N



T4P2 post ex



T4P2 pre ex



T4P3 post ex north section



T4P3 pre ex



T4P4 context N



T4P4 post ex north section



T4P4 pre ex



T4P5 north section



T4P5 post ex



T4P5 pre ex



T4P6 north section



T4P6 post ex



T4P6 pre ex



T4P7 context N



T4P7 post ex north section



T4P7 pre ex



T4P8 context N



T4P8 post ex



T4P8 pre ex



T4P9 context N



T4P9 post ex north section



T4P9 pre ex



T4P10 context N



T4P10 post ex north section



T4P10 pre ex



T4P11 context N



T4P11 north section



T4P11 post ex



T4P11 pre ex



T4P12 context



T4P12 north section



T4P12 post ex



T4P12 pre ex



T4P13 context N



T4P13 north section



T4P13 post ex



T4P13 pre ex



T4P14 context N



T4P14 north section



T4P14 post ex



T4P14 pre ex



T4P14 south section



T4P15 context N



T4P15 north section



T4P15 post ex



T4P15 pre ex



T4P16 context N



T4P16 context W



T4P16 north section



T4P16 post ex



T4P16 pre ex



T5P1 context N



T5P1 north section



T5P1 post ex



T5P1 pre ex



T5P2 context N



T5P2 north section



T5P2 post ex



T5P2 pre ex



T5P3 context N



T5P3 north section



T5P3 post ex



T5P3 pre ex



T5P4 context N



T5P4 north section



T5P4 post ex



T5P4 pre ex



T5P5 context



T5P5 north section



T5P5 post ex



T5P5 pre ex



T5P6 context W



T5P6 north section



T5P6 post ex



T5P6 pre ex



T5P7 context N



T5P7 post ex



T5P7 pre ex



T5P8 context N



T5P8 north section



T5P8 post ex



T5P9 north section



T5P9 post ex



T6P1 post ex



T6P1 pre ex



T6P2 context N



T6P2 post ex north section



T6P2 pre ex



T6P3 north section



T6P3 post ex



T6P3 pre ex context N



T6P4 post ex



T6P4 pre ex



T6P5 context N



T6P5 post ex



T6P5 pre ex



T7P1 context N



T7P1 post ex



T7P1 pre ex



T7P2 context N



T7P2 north section



T7P2 post ex



T7P2 pre ex



T7P3 context



T7P3 post ex



T7P3 pre ex



T7P4 context



T7P4 post ex



T7P4 pre ex



T7P5 context N



T7P5 post ex



T7P5 pre ex



T7P7 context N



T7P7 post ex



T7P7 pre ex



T7P8 context N



T7P8 post ex



T7P8 pre ex



T8P1 context



T8P1 north section



T8P1 post ex



T8P1 pre ex



T8P2 context N



T8P2 post ex



T8P2 pre ex



T9P1 context N



T9P1 north section



T9P1 post ex



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T9P2 context N



T9P2 post ex



T9P2 pre ex



T9P4 context N



T9P4 post ex



T9P4 pre ex



T9P5 context N



T9P5 post ex



T9P5 pre ex



T11P1 context



T11P1 post ex



T11P1 pre ex



T12P2 context N



T12P2 post ex



T12P2 pre ex



T12P3 context N



T12P3 post ex north section



T12P3 pre ex



T13P1 context N



T13P1 post ex



T13P1 pre ex



T13P4 post ex



T13P4 pre ex context N



T13P5 context N



T13P5 north section



T13P5 post ex



T13P5 pre ex



T14P1 context N



T14P1 north section



T14P1 post ex



T14P1 pre ex



T14P3 context N



T14P3 post ex



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T15P2 context N



T15P2 north section



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T18P4 context N



T18P4 north section



T18P4 post ex



T18P4 pre ex



T18P5 context N



T18P5 north section



T18P5 post ex



T18P5 pre ex



T18P6 context N



T18P6 north section



T18P6 post ex



T18P6 pre ex



T19P1 context N



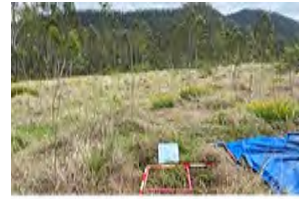
T19P1 north section



T19P1 post ex



T19P1 pre ex



T19P2 context N



T19P2 north section



T19P2 post ex



T19P2 pre ex



T19P3 context N



T19P3 north section



T19P3 post ex



T19P3 pre ex



T19P4 context S



T19P4 post ex



T19P4 pre ex



T19P5 context N



T19P5 north section



T19P5 post ex



T19P5 pre ex



T19P6 context N



T19P6 north section



T19P6 post ex



T19P6 pre ex



T20P1 context N



T20P1 north section



T20P1 post ex



T20P1 pre ex



T20P2 context N



T20P2 north section



T20P2 post ex



T20P2 pre ex



T21P1 context N



T21P1 post ex



T21P1 pre ex



T21P2 context N



T21P2 post ex



T21P2 pre ex



T22P1 context N



T22P1 north section



T22P1 post ex



T22P1 pre ex



T22P2 context N



T22P2 north section



T22P2 post ex



T22P2 pre ex



T22P3 context N



T22P3 north section



T22P3 post ex



T22P3 pre ex



T23P1 context N



T23P1 post ex



T23P2 context N



T23P2 pre ex



TP23P1 pre ex

F.6 Lithics analysis report

ARTEFACT ANALYSIS OF THE OVEN MOUNTAIN (OMPS) ASSEMBLAGE

Dr Trudy Doelman

Introduction

The analysis of the Oven Mountain (OMPS) lithic assemblage follows a series of research questions which can broadly be divided into six main categories:

1. **Site occupation/chronology.** When was the area occupied? Was the assemblage the product of repeated occupations or a single event? Do the characteristics of the assemblage change over time in the sub-surface excavation? How intensive was the occupation? Is there potential for a Pleistocene occupation?
2. **Lithic Source procurement.** Which raw material resources were used? What types of raw material sources were used (primary and secondary)? Does a preference for a raw material occur? Can we infer the distance from the sources based on artefact size and the frequency and amount of cortex?
3. **Stone reduction technology.** How were cores prepared and worked? Were systematic core reduction strategies employed? The analysis will be broken down into descriptions of the:
 - a. Core attributes.
 - b. Flake attributes.
 - c. Tools.
4. **Site function.** What types of activities occurred on-site/s? Do discrete areas of stone working occur? Can site function be related to environmental factors i.e. distance to sources? This analysis includes comparisons of the artefact density by location, the assemblage composition (number of cores, complete flakes, split flakes, broken flakes, tools and other artefact types e.g. grinding stone, axes, hammerstones) and frequencies of artefact types (represented by ratios of cores: complete flakes, complete flakes: broken flakes etc).
5. **Regional comparisons.** How does this assemblage compare with others in the surrounding region?
6. **Spatial patterning.** Data from the technological analysis allows a spatial analysis of the artefact attributes.
7. **Site disturbance.** A further analysis was undertaken on the excavated assemblage to assess the nature and integrity of the sub-surface deposit. What post-depositional influences have impacted on the assemblage (e.g. size-sorting, historical disturbance)?

Analysis Methodology

The selection of the artefact attributes addresses the above research questions. The analysis will follow those relevant to a technological and/or spatial analysis (Table 1).

The attributes recorded for each artefact are dependent on the technological class (i.e., if a complete flake, core or tool etc). Artefacts such as cores and tool generally represent a small fraction of an assemblage but can offer the greatest amount of information. These additional attributes provide further information to examine the types of technological strategies used to prepare and reduce cores, the intensity of core reduction (curation) and can contribute to an understanding of the product/s manufactured, patterns of mobility and the transportation of artefacts (Table 1). For the analysis of raw material types, an additional attribute was added to distinguish between clear, translucent and opaque varieties of macrocrystalline quartz.

Artefacts were cleaned, sorted, individually analysed and entered into the software program E4 loaded with a configuration file written for this specific purpose. This program prompts the user to record all relevant attributes through a series of menus based on the artefact type (e.g. core, complete flake, complete tool etc) which is then stored in a Microsoft Access database. In this way a comprehensive typological, technological and metrical analysis of the excavated assemblage was undertaken. The location of the excavated artefacts was also recorded by site, spit/depth and excavation square. Analysis was aided using a 10x hand lens and a standard digital Vernier calliper. Measurements were made in millimetres to one decimal place (Appendix A). Weights of each artefact was also recorded to two decimal places. A definition of the terms used for the artefact types and their attributes can be found in Appendix B of this report.

Attributes	
Technological class	Artefact type (e.g. core, complete flake, longitudinal split, flake fragmentation, retouch, angular fragments/lithic fragments, other (axe, grindstone etc).
Material	Raw Material type (silcrete tuff, chert, quartz, quartzite etc).
Translucency	Clear, translucent, opaque.
Colour	Raw material colour.
Cortex	Percentage of cortex (if on a flake – amount on the dorsal surface of a flake).
Cortex type	Type of cortex (rough/terrestrial, water-rolled/tabular).
Platform type	unifacial, crushing/missing, Flaked (>2 flake scars), Facetted (3 or more small, systematic flake removals), Cortical (with cortex), n/a (complete flakes and complete tools).
Termination type	Feather, hinge, step, plunge, step, cortical, platform, abrupt.
Tool type	Select the type of tool – use wear, concave scraper, convex scraper, straight scraper, elouera (backed artefact), notched scraper, end scraper, saw, stepped scraper, drill, backed (generic), bondi point, thumbnail scraper, denticulate, burin, geometric microlith, nosed scraper.
Maximum dimension	All artefacts (in size groupings).
Length complete flake	Axial length of the complete flake/complete tool (in mm to 1 dp).
Weight	Weight of the artefact in grams to 1 dp.
Complete flakes and complete tools	
Form	Form of the flake – Indeterminate, Expanding, Block (angular Fragment), Blade, N/A, Platform Rejuvenation Flake (tablet), Bipolar, Errailure, Ridge straightening flake, elongated flake. These attributes reflect core reduction strategies.
Complete tools	(Examines measures of curation and use).
Retouch edge	The number of retouched quadrants (on complete tools only).

Retouch type 1, 2, 3, 4	Select the retouch type for quadrants 1, 2, 3 and 4.
Cores	Identifying technological strategies and intensity of reduction
Core type	Uni-, bi-, and multi-platform, prismatic, burin-blade core, test, bipolar, bifacial.
Core body	Core body form – block, flake, nodule, non-diagnostic.
Scar form	Primary scar form? – elongated, expanding, blade, mixed.
Core platform no.	Number of platforms on the core.
Step termination	Number of step terminations on the core.
Hinge termination	Number of hinge terminations on the core.
Number of Core Scars	Number of core scars.
Metrical attributes	(In mm to 1 dp).
Maximum length	
Length complete flake	Axial length of the complete flake/complete tool.
Width	Maximum width of the complete flake/tool/core.
Thickness	Maximum thickness of the complete flake/tool/core at mid-point.
Core length	Maximum length from the working platform.
Platform width	Platform width – proximal and complete flakes and tools.
Platform thickness	Platform thickness – proximal and complete flakes and tools (and complete splits).
Weight	Weight of the artefact in grams to 1dp.

Table 1 Artefact Attributes recorded for the OMPS assemblage

Assemblage Distribution

A series of 116 squares were excavated in 42 transects along the Macleay River. A total of 2465 artefacts were recovered (Table 2). Only 17 transects had artefacts with the vast majority found in T7 (Transect 7) (n=2081, 84.4%). Of these, most artefacts were found in T7P1 (n=2,014, 81.7%). In this location and T8P2, T13P5, T13P6, T14P2, T21P1, T22P1 and T23P1 complete and broken fragments of quartz crystals were also found (n=69). Again, most of these were found in T7P1 (n=26, 37.7%). Non-artefactual quartz rubble was also recovered with most also found in in T7P1 (n=230) and these account for 83.1% by weight of the total recovered in all transects.

Only three test squares had 50 or more artefacts and one excavation square had more than 2,000 artefacts (T7P1). The artefact density, including T7P1, was 21.1 artefacts per 0.25m². However, if this square is excluded the artefact density drops to 3.3 artefacts per 0.25m². The analysis will focus on the provenience artefacts from excavated contexts.

<i>SQ</i>	<i>Total</i>	<i>Weight (g)</i>	<i>SQ</i>	<i>Total</i>	<i>Weight (g)</i>
T4P1	2	3	T11P1	3	0.89
T4P2	6	10.77	T11P2	1	53.47
T4P13	23	99.34	T12P3	6	28.94
T4P15	4	11.64	T13P5	51	22.45
T4P16	10	102.98	T13P6	47	34.16
T5P1	16	156.48	T14P2	3	0.66
T5P2	7	35.21	T14P3	2	0.29
T5P4	1	21.75	T15P1	37	46.29
T5P5	3	3.77	T15P2	13	1.61
T5P8	15	48.17	T15P3	9	9.56
T6P1	14	5.34	T15P4	3	0.64
T6P2	1	19.31	T17P3	3	0.77
T7P1	2014	3863.04	T18P3	2	4.09
T7P1C	6	130.08	T19P2	2	0.66
T7P3	59	583.45	T19P3	4	7.12
T7P7	2	1.51	T19P4	19	51.56
T8P2	4	2.28	T19P5	25	65.34
T9P2	9	12.8	T20P2	3	64.65
T9P4	12	8.79	T22P2	1	0.77
			T22P1	18	21.01
			T23P1	5	110.05
Total				2465	5644.69

Table 2 *Counts of artefacts in the test pits from the OMPS assemblage*

Artefacts in Spit 4 account for 73.1% (n=1800) of the assemblage. By weight this proportion drops to 48.9% (3034.38 g). In Spit 4 the average weight of the artefacts also drops from 5.3 g in Spit 3 to 1.7 g (Figure 1). It is worth noting, as a cautionary tale, that that conjoins in a sandy context, were found up to 40cm apart vertically in an excavation of a rockshelter (Richardson 1992). However, artefacts in an open site also in a sandy context have shown conjoins of up to 90 cm apart vertically (Way 2017). Figure 1 shows the average weight, total weights and counts of artefacts per spit. This figure clearly shows an increase in weight and counts in spit 4 coupled with a decrease in average weight.

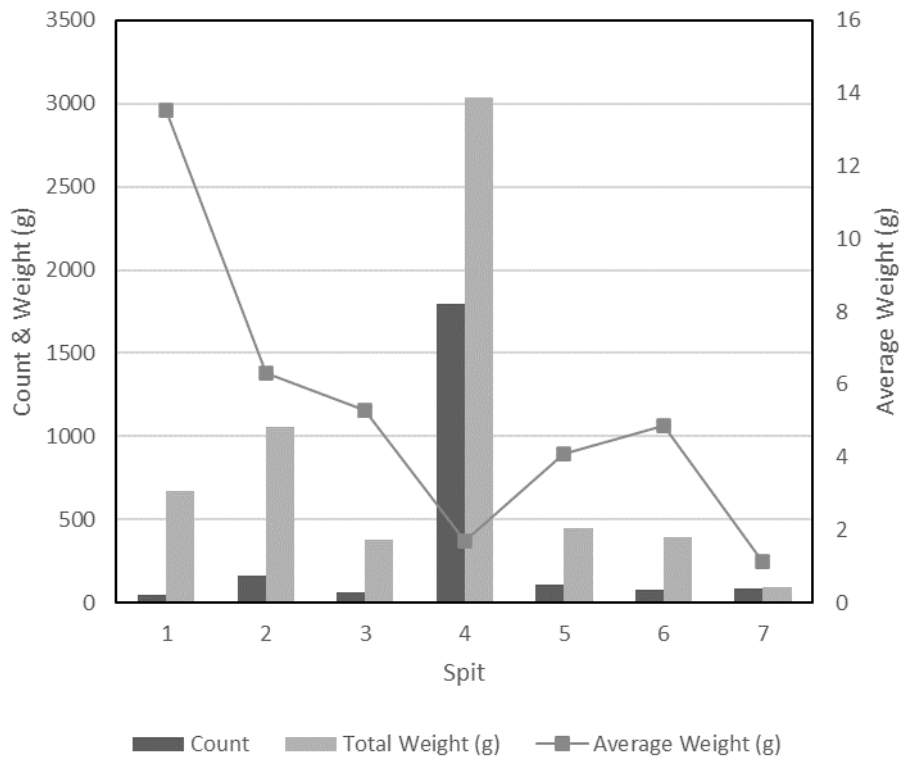


Figure 1 Artefact counts by spit and weight in the OMPS assemblage

Table 3 shows the number of complete flakes from each spit and the mean maximum lengths and weights. Higher numbers of artefacts occur in Spits 2 and 4 could reflect two occupations (Table 3). However, no significant difference in the complete flakes occurs between Spits 3 and 4 ($t=1.394$, $df=201$, $p=0.1648$) in the maximum length or by weight ($t=1.199$, $df=201$, $p=0.2341$). No significant difference between Spits 2 and 3 ($t=0.8537$, $df=57$, $p=0.3968$) in the length of complete flakes. Weight is influenced by id=397, a large complete flake in Spit 2. These results indicate the same size profile for Spits 2, 3 and 4 suggesting a single occupation surface with the likely downwards movement of small broken flakes into Spit 4.

Spit	Count	%	Mean Length (mm)	Std. Dev	Total Weight (g)	Mean Weight (mm)	Std. Dev.
1	1	6	22.7	5.8	2.4	3.1	14.2
2	2	49	23.8	17.0	15.4	70.4	753.6
3	3	16	27.7	13.2	6.1	7.6	97.0
4	4	187	24.1	9.6	3.9	7.0	732.2
5	5	41	26.5	12.9	6.2	9.1	253.5
6	6	27	22.6	8.5	3.0	4.3	82.3
7	7	31	19.3	6.9	1.7	2.9	51.4
surface/unknown	surface	2	10.8	1.2	0.4	0.0	0.8
Total		359					

Table 3 Artefact counts by spit and maximum length of complete flakes in the OMPS assemblage

Site Chronology/Occupation

The chronology of the occupation needs to be assessed prior to the technological analysis. A useful guide for assessing site age is the presence or absence of backed artefacts. These artefacts are typically only found in mid to late Holocene sites (<5000 years BP) throughout most of eastern Australia (Attenbrow 2002: 115-159, Hiscock 2008). However, no backed artefacts were found in the assemblage. The presence of four flakes identified as blades can also typologically dated to the mid to late Holocene. In addition, the increase in the use of macrocrystalline or milky quartz is thought to increase in the late Holocene prior to European contact (Attenbrow 2002).

Stone Procurement

Available Stone Sources

A limited diversity of raw material types was found in the assemblage (Table 4). A description of the dominant raw materials is provided. Individual material types were further classified by colour to potentially distinguish sources and/or individual cobbles. The raw materials will now be described.

<i>Material</i>	<i>Count</i>	<i>%</i>
Chalcedony	5	0.2
CCQ	18	0.7
Crystal Quartz	331	13.3
Milky Quartz	2090	84.8
Silicified Wood	1	0.0
Indurated mudstone	2	0.1
Volcanic	14	0.6
Quartzite	4	0.2
Total	2465	

Table 4 Raw materials from excavated contexts in the OMPS assemblage

Quartz

Quartz is a mineral composed of silicon dioxide (SiO₂) and is the second most abundant mineral in the Earth's crust (after feldspar); it is common in igneous, metamorphic, and sedimentary rocks (Lapidus 1990:429). Due to its abundance, hardness and often excellent flaking properties, quartz varieties are frequently found in archaeological sites throughout the world (Seong 2004:76-77).

Quartz can occur in small to very large crystal form (macrocrystalline, MCQ) or as a fine-grained material with crystals invisible to the unaided eye (microcrystalline/cryptocrystalline quartz, CCQ). Macrocrystalline quartz is extremely smooth and reflects enough light to have a vitreous lustre. In archaeology, macrocrystalline quartz is generally divided into milky and crystal quartz. However, what has not been widely acknowledged is the variation found in milky quartz sources which influences its ability to flake conchoidally.

Microcrystalline quartz scatters light and has a dull or sub-vitreous lustre. Microcrystalline quartz can be divided into a number of varieties distinguished by colour, banding or degree of translucency. Chert is opaque specimen of microcrystalline quartz (Andrefsky 1998: 41; Odell 2004: 19). Chalcedony is a term used collectively to distinguish translucent, monochromatic varieties of microcrystalline quartz.

The formation of the milky quartz in veins influences its *flaking properties* in a number of ways. Typically, milky quartz can vary from semi-translucent to opaque depending on the amount of gas and/or liquid inclusions trapped during formation (Knight 2016:37-38). These inclusions impact on the flaking properties of the milky quartz i.e. the whiter, opaque milky quartz has a higher number of inclusions resulting in a less conchoidal fracture and breakage during core reduction. In addition, the crystal size will also influence fracture depending on the number of crystal boundaries. For example, quartz with few crystal boundaries (larger crystals) will have a conchoidal fracture with prominent bulbs of percussion. In contrast, vein quartz with more crystal boundaries can produce a 'hackly' fracture with a "rough, jagged and sharp edged" surface (Berry et al. 1983:190). Lastly, the presence or absence of fracture planes (flaws/fractures) dictates its suitability for flaking (e.g. ids=120, 461, 450, 440). The presence of these planes can cause the flaking forces to deviate or stop (Cotterell and Kamminga 1987:679). As a result, it is often difficult to predict and control the path of a flake when removed and the frequency of breakages during manufacture increases. Points of impact, crushing and radiating fractures indicate where a core was struck.

Due to its physical properties the reduction of milky quartz cores creates a highly fragmented assemblage (i.e. a large number of broken flakes and angular fragments). For example, in experimental work quartz was found to produce 4.5x debris (>10 mm in length) than flaking cryptocrystalline materials (e.g. chert) and relatively fewer complete flakes (Driscoll 2010:339, Tallavaara et al. 2010). The frequency of cores to complete flakes will also be high as more cores are used to manufacture less complete flakes. However, milky quartz does have the ability to produce and maintain a sharp, strong working edge without retouch, which is suitable for cutting and scrapping (Knight 2016:46).

As noted, the formation and thus translucency of milky quartz influences its ability to flake conchoidally. As a result, this characteristic was included in the analysis. Below is a useful way to classify crystalline and cryptocrystalline quartz varieties at the project area:

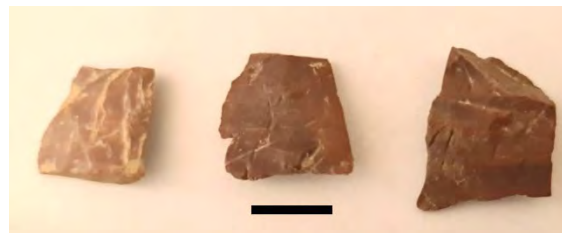
- A) If it has a vitreous lustre on conchoidal surfaces, it is coarsely crystalline quartz (crystalline quartz):
- if it is clear with a vitreous lustre, it is a crystal quartz;
 - if it is opaque and white it is milky quartz and low quality; or
 - if it is translucent and clear/white it is considered crystal quartz.
- B) If it has a dull lustre on conchoidal surfaces, it is a variety of microcrystalline/cryptocrystalline quartz:
- if it is translucent, and not banded, the name chalcedony is used; or
 - if it is opaque and smooth, it is chert.

The assemblage in the OMPS project area is dominated by milky quartz artefacts (n=2090, 84.5%). The quality of milky quartz is hackly and highly brittle often breaking along cleavage lines or internal flaws. Hand-held percussion was generally used on the larger cores and sometimes requiring a bipolar technique to split. Colours also vary, depending on the impurities, from yellow, red/white to light grey. However, white, translucent milky quartz dominated the assemblage (n=1781, 75.3%). Large numbers (n=330) of highly cortical quartz rubble were also found in the assemblage. Most of these fragments were found in T7P1 (n=236, 71.5%). Given the large these fragments coupled with the large number of flaking debris it is probable that location is a quarry where quartz was extracted from a thick, exposed vein greater than 10 cm.

Crystal quartz was also found in the assemblage. Colours also varied depending on the impurities, from yellow, white/translucent, clear to light grey.

The chalcedony artefacts, a microcrystalline quartz, found in the OMPS assemblage vary in texture and colour (e.g. black, brown and grey). Examples were found of artefacts which graded in grain size, colour and quality (e.g. ids=74, 119) to a macrocrystalline black/grey quartz. These were found in T5P1 (n=13). T4P13 also had a black, translucent, cryptocrystalline quartz (CCQ, n=8) which also graded towards chalcedony.

Three flakes of red jasper (a cryptocrystalline quartz) were also recovered from five test pits in T4P13, T5P1, T6P2, T15P3 and T23P1 (Figure 2).



**Figure 2 Examples of red CCQ (jasper) artefacts in T23P1 (id=435), T5P1 (id=84) and T4P13(id=445)
From left to right (scale=1cm)**

Silicified wood

Silicified wood forms when plant remains are buried rapidly in wet sediments and saturated with dissolved minerals – i.e. silica. The lack of oxygen slows decay of the wood, allowing minerals to replace cell walls and to fill void spaces in the wood. The resulting mineral retains the plant's original structure i.e., tree rings. Only one flake of silicified wood was found.

Siliceous Siltstone/Mudstone/Tuff? (IMT)

Mudstone is a sedimentary rock composed primarily of clay- or silt-sized particles (less than 0.063 mm in diameter) whereas a siltstone must contain over 50% silt-sized material. Silt is any particle smaller than sand, 0.06 mm, and larger than clay, > 0.0039 mm. A simple test to determine whether a rock is a mudstone is to if it feels gritty or chalky. Only two tuff artefacts were found.

Siliceous rocks are sedimentary rocks that have silica (SiO₂) as the principal constituent. A siliceous siltstone/mudstone has silica precipitated throughout the rock making it hard and able to flake conchoidally. The size of the grains distinguishes between mudstone and siltstone. It can be from microscopic, with a smooth feel, to fine-grained with a visible matrix. The highly silicified siltstone is chert-like and it appears that this raw material type can be grade towards chert in the project area but retains a chalky feel. This material was collectively called IMT.

Other Raw Material Types

Ten artefacts of made from extrusive volcanics were found in the assemblage. Four artefacts made from quartzite, a contact metamorphic rock, were also found.

Assemblage Characteristics of Procurement

The cortex (or weathered exterior of the parent rock) provides information about the type of stone sources used (i.e. a primary or secondary source). Artefacts with a rough (also called terrestrial) cortex were acquired from a primary source (or an in-situ outcrop. This type of cortex is also considered to be from a primary/terrestrial exposure. Artefacts with a smooth or water-rolled cortex originate from a secondary source (e.g. a cobble from a waterway, having a smoothed surface).

The amount of cortex on an artefact often indicates the distance artefacts were transported from the source (Hiscock and Mitchell 1993:12-17, Table 5). A high percentage of cortex on an artefact indicates that the source of stone was nearby while artefacts with less cortex or no cortex were typically transported further from the source. Equally, as cores are transported away from the source they are reduced further, and the resulting flakes are also smaller. The amount of cortex can also reflect the size of the core body i.e. flakes removed from a small pebble will retain more cortex.

To understand the use of stone sources in the assemblage the raw material types and their characteristics were compared. As noted, the assemblage was dominated by white, macrocrystalline quartz (milky quartz) (Figure 3). This material was acquired from a large, thick exposed vein. As a result, relatively little cortex occurred on the artefacts. For example, of the complete flakes and complete tools 71.2% (n=210) have no cortex. Unlike a cobble, cortex on a vein source is only found at the top and bottom margins of the vein. Veins can be naturally exposed in profile, such as a creek cutting, or eroded from a surface outcrop. The source, at or near T7P1 is likely to be a vein exposed in profile which eases extraction and accounts for the large number of artefacts and cortical rubble. In addition, a weathered cortex was also observed. This cortex marks where the vein was exposed at the surface. Lastly, where fracture breaks are formed along internal flaws water has migrated through cracks or cleavage lines. This process creates an orange staining on usually the dorsal surface of an artefact and caused the artefact to fragment further when struck by a hammerstone. In the cavities of the vein crystals were formed i.e. crystal quartz (Figure 4).

These ranged in size from 11.2 mm to 37.8 mm. Some of the complete flakes retain a crystal facet on the dorsal surface and were also obtained from an outcropping vein. Only two complete flakes of milky quartz were obtained from a secondary source.

<i>Material</i>	<i>Complete Flake</i>	<i>%</i>	<i>Mean Axial Length (mm)</i>	<i>Std dev.</i>	<i>Outcrop</i>	<i>Water-rolled</i>	<i>Facet</i>
CCQ	9	2.5	29.2	10.1	4	3	
Chalcedony	3	0.8	14.8	1.7			
Crystal Quartz	51	13.9	14.0	4.9	10		
Milky Quartz	295	80.6	21.7	9.4	116	2	7
Silicified wood	1	0.3	30.2			1	
Tuff	2	0.5	32.2	2.5		1	
Volcanic	5	1.4	18.6	9.9		9	
Total	366						

Table 5 Raw material types and the type of cortex in the OMPS assemblage

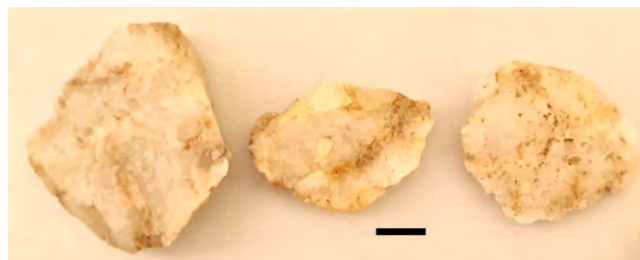


Figure 3 Examples of complete flakes of translucent, macrocrystalline quartz (milky quartz) in T7P1. From left to right, id=3, id=286, id=320 (scale=1cm)

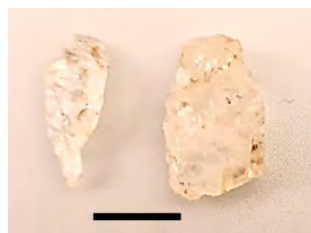


Figure 4 examples of complete flakes of clear, macrocrystalline quartz (crystal quartz) in T7P1. From left to right, id=63, id=283 (scale=1cm)

Other raw material types have a water-rolled cortex (e.g. volcanics, tuff, CCQ, silicified wood).

The mean axial lengths of the complete flakes for all the raw material types are highly variable (Table 5). However, over 50 artefacts (n=59, 16.1%) artefacts are larger than 30 mm. Most of these are made from milky quartz (n=48). The maximum length of the complete flakes (milky quartz, 68.7 mm) which again suggests that the size of the cores was large and/or the distance from the source was nearby.

To identify whether individual sources or cobbles were exploited, the colour of the artefacts by raw material type was compared. Links can also be made between source and discard locations. For example, a red/white milky quartz was identified in T7P1 (source), T4P13, T19P3, T19P4, T13P6, T4P15, T22P1 and T9P4. Another example is the concentration of black/grey CCQ, chalcedony and MCQ in Transects 4, 5, 6 and 15 (Table 6). As previously noted, this material grades in quality but appears to be manufactured from one water-rolled cobble. The red CCQ (jasper) also appears to have been manufactured from one core. These artefacts are found in Transects 2, 4, 5 and 15. These artefacts show clear links between the transects.

<i>Transect 2</i>	<i>Transect 3</i>	<i>Transect 4</i>	<i>Transect 5</i>	<i>Transect 6</i>	<i>Transect 7</i>	<i>Transect 15</i>
red CCQ		red CCQ black CCQ black MCQ black chalcedony	red CCQ black CCQ grey CCQ grey chalcedony grey MCQ	red CCQ	Source MCQ	grey CCQ red CCQ black CCQ

Table 6 Raw material types and the type of cortex in the OMPS assemblage

Stone Reduction Technology

The types of artefacts and their characteristics are used to establish how sources were worked, used and discarded on-site. Artefacts were classified as cores or flakes, broken or complete and retouched (tools) or non-retouched. Artefacts that were shattered through extreme heat/or weathering and could not be identified by type but had a flaked surface were called a heat-fractured artefact (HFA). HSAs were included in the analysis as they represent post-depositional influences on the assemblage. By-products of flaking also include angular fragments (blocks). Angular fragments are very common in quartz assemblages and at stone sources (Doelman 2008).

Assemblage Composition

The excavated assemblage of milky quartz is dominated by broken flakes (Table 7). Broken flakes (unretouched proximal, broken and distal flakes) account for 50.8% (n=1253) of the assemblage. Angular fragments also occur in high numbers (Table 7). Only 366 complete flakes (14.8%) were found in the assemblage. A total of 27 cores and nine tools were found (Table 7). The tools account for only 0.4% of the assemblage. There is a relatively high number of complete splits (n=35) indicating on-site manufacture. This type of flake indicates not only on-site flaking but also the highly fractured nature of a milky quartz assemblage.

	Core	Core Fragment	Complete Flake	Complete Split	Broken Flake	Complete Tool	Broken Tool	Angular Fragments	HFA	Grinding Fragment
T4P1			1					1		
T4P2					3			3		
T4P13			8	4	6	1		3	1	
T4P15			2		2					
T4P16			4				1	5		
T5P1	3	1	8		2	2				
T5P2			4				1	2		
T5P4						1				
T5P5	1		1		1					
T5P8	1		6		5	2		1		
T6P1					11			3		
T6P2						1				
T7P1	17	8	272	25	1042			650		
T7P1C			6							
T7P3		1	13	3	27			15		
T7P7			2							
T8P2					4					
T9P2			4		3			5		
T9P4			7		5					
T11P1					3					
T11P2										1
T12P3			1		5					
T13P5	2		8		29			12		
T13P6			5		28			14		
T14P2					2			1		
T15P1	2				16			19		
T15P2					12			1		
T15P3			5	1				3		
T15P4					3					
T17P3					3					
T18P3								2		
T19P2					2					
T19P3					3			1		
T19P4		1	5		6			7		
T19P5		1	1		17			6		
T20P2		1		1	1					
T22P1			2		10			4		1
T22P2				1						
T23P1	1		1		2			1		
Count	27	13	366	35	1253	7	2	759	1	2
%	1.1	0.5	14.8	1.4	50.8	0.3	0.1	30.8	0.0	0.1

Table 7 Assemblage composition in the OMPS assemblage

In addition, one heat shattered artefact and two flaked grinding stone fragments were also found.

Artefact Ratios

Comparisons were made between the excavated squares (T7P1, T13P5 and T7P3) with the highest artefacts density to identify different discard behaviours. The ratios of cores: complete flakes show that a higher frequency of cores occurs in the assemblage (0:13) in T7P3 in comparison to T7P1 (1:34). This result can be coupled with a higher number of broken flakes to complete flakes in T7P1 (261:1) (Table 8). In T13P5 there is a higher frequency of complete flakes and cores. This result further suggests a highly fragmented assemblage in T7P1. These results indicate that while core reduction occurred on-site, reflected in the high numbers of complete splits, few complete flakes were removed from each core.

	<i>Complete Flake: core</i>	<i>Complete flake: broken flake</i>	<i>Total</i>
T7P1	34:1	1:0.261	2014
T7P3	13:0	1:0.481	59
T13P5	4:1	1:3.75	51

Table 8 Ratios of milky quartz and crystal quartz artefacts in the OMPS assemblage

Broken flakes often result from breakage during manufacture, post-depositional breakage (ploughing, treadage) or the deliberate snapping of complete flakes during the manufacture of particular tools, such as geometric microliths, where the snapped margins are backed (Boot 1987: 10-15; Holdaway and Stern 2004: 133-135). However, the frequency of broken flakes in the assemblage made from milky quartz reflects its flaking properties (i.e. milky quartz artefacts are more likely to shatter during core reduction) or produce complete splits especially using bipolar reduction. The lower frequency of cores to complete flakes indicates the difficulties of flaking this raw material type.

Very few milky quartz artefacts were retouched. In the total assemblage only nine tools were identified representing 0.4% of the assemblage. Of these, two were made from crystal quartz and one from milky quartz.

Cores

A total of 27 cores and 13 core fragments were found in the excavated assemblage (Table 7). Most were found in T7P1 (n=17) and made from milky quartz (n=20). Smaller numbers of crystal quartz (n=5) were also found (Table 9). The grinding stone fragment (id=71) also had flakes removed. One core was made on a water-rolled nodule of grey, volcanic material and a small alternate-blade core was made from black/dark grey CCQ.

The milky quartz cores have a mean size of 41.1 mm (Table 9). The largest milky quartz core has a maximum length of 68.0 mm. In comparison, the crystal quartz cores, reflects the size of the crystals, have a mean size of only 26.8 mm and a maximum size of 37.8 mm. Figure 5 shows a yellow, multi-directional core made on a crystal (id=132) in T5P8. A similar core was found in T7P1 (id=140).



Figure 5 Cores found at OMPS
Left to right id=99, id=147, id=132 (scale 1 cm)

The scar form on the cores shows that over half were used to manufacture elongated flakes (n=13, Table 9). Most of the milky quartz cores were made on blocky fragments. Large flakes also used as cores and flaked using a freehand method. In contrast, smaller cores made on flakes were flaked using a bipolar technique.

<i>Material</i>	<i>Core Type</i>	<i>Count</i>	<i>Core Body</i>	<i>Scar Form</i>	<i>Platform Number</i>	<i>Mean Length (mm)</i>	<i>Std Dev.</i>
Crystal Quartz	bipolar	1	crystal	elongated	1	17.3	
	bipolar	1	crystal	expanding	1	37.8	
	bipolar	1	flake	elongated	1	20.1	
	Multi-directional	1	crystal	mixed	3	34.9	
	Uni-directional	1	crystal	expanding	1	24.0	
Total		5				26.8	9.1
Milky Quartz	Atypical burin-blade	1	block	elongated	2	45.7	
	Atypical burin-blade	1	crystal	elongated	1	26.9	
	Atypical burin-blade	1	block	elongated	2	38.5	
	Bi-directional	2	block	expanding	2	47.7	21.1
	Bi-directional	2	block	mixed	2	36.6	1.9
	Bi-directional	1	flake	expanding	2	68.0	
	bipolar	1	block	elongated	1	35.0	
	bipolar	1	block	expanding	1	23.9	
	bipolar	1	flake	elongated	1	25.0	
	bipolar	1	flake	elongated	1	56.3	
	test	1	block	elongated	1	53.0	
	test	1	block	expanding	1	66.2	
	Uni-directional	1	block	elongated	1	47.5	
	Uni-directional	1	block	expanding	1	52.7	
	Uni-directional	2	flake	elongated	1	41.0	7.8
Uni-directional	1	flake	expanding	1	40.6		
Uni-directional	1	flake	mixed	1	53.2		
Volcanic	Atypical burin-blade	1	block	elongated	1	40.9	
CCQ	Alternate-blade	1	flake	elongated	3	31.1	
Total		27				40.3	13.8

Table 9 Size of the cores by raw material type in the OMPS assemblage

Seven core types were found in the OMPS assemblage (Table 9). As the core became smaller a bipolar technique was used. This technique was typically used on crystal quartz cores. Only four cores have any evidence of systematic preparation. These cores were flaked longitudinally by resting the core on an anvil to remove elongated flakes (Figure 5, id=99, id=147). Elongated flakes were also removed from naturally occurring ridge lines on angular blocks or nodules rather than on flake margins (id=501). Most cores were discarded when exhausted due to internal flaws or from high platform angles. Few flakes were removed from each core. At T7P1 ample raw material was available and little care was invested in working cores.

Systematic Core Reduction Strategies

Evidence of systematic core reduction at the project area is seen by the presence of atypical burin-blade cores (Table 9). These atypical burin-blade cores (n=2) were made angular blocks. The cores show the deliberate removal of flakes along a lateral margin. This technique is one way of manufacturing elongated flakes of the same length and width. Typical burin-blade cores are generally made on a large flake, typically one margin is prepared as a platform for the removal of flakes, usually across the termination of the original flake (Holdaway and Stern 2004: 205-206). Burin-blade cores have also been called the Redbank A Strategy in Hunter Valley assemblages (Hiscock 1993). The elongated flakes produced are typically retouched as backed artefacts. In contrast, atypical burin-blade cores from were usually made on angular blocks struck along a lateral margin. These core types indicate innovations in the manufacture of elongated flakes, particularly for the milky quartz.

- Id = 99 was found in T5P1. It is a grey/black macrocrystalline quartz atypical burin-blade core with a water-rolled cortex and considered blocky in form.
- Id = 147 was also found in T5P1. It is a white, milky quartz atypical burin-blade core with no cortex and a single flake removed from the margin.
- Id = 501 was found in T15P1. It is a grey volcanic material made on a water-rolled nodule with a single burin-like flake removed from a thin margin.

A single alternate-blade core was identified.

- Id = 502 was found in T15P1. It is a grey/black CCQ material and made on a flake. It was intensively used with three platforms with flakes removed bifacially.

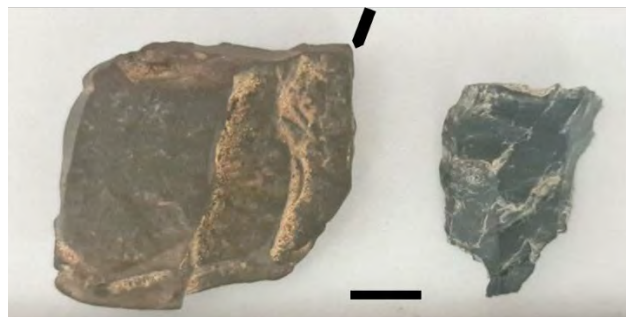


Figure 5 Systematic cores found at OMPS
Left to right id=501, id=147, id=502. Arrows show location of flake removal (scale 1 cm).

Flakes

The characteristics of the complete flakes are used to support and further enhance the results of the core analysis.

The form of the complete flakes is used to determine how cores were reduced and what was manufactured on-site. Indeterminate, block and elongated flakes dominate the milky quartz assemblage while elongated flakes are more common in the crystal quartz assemblage (Table 10). These results somewhat correlate with the form of the flake scars on the cores which are mainly elongated for milky quartz. Blocky flakes tend to be produced early in core reduction but can't be easily identified on a core (Doelman 2008). Most of the complete flakes with this form was found in T7P1 (n=272, 75.8%) further indicating that this location was a stone source. The presence of platform rejuvenation flakes (n=17) indicates that the use-life of cores was extended on-site. Platform rejuvenation flakes (also known as a core rejuvenation flake) were used to both create a new platform and to limit flaking mistakes by reducing the angle of the striking platform thereby extending the life of a core (Odell 2003: 121). Again, these flakes were mostly found in T7P1 (n=12).

Only four flakes (complete and broken) were defined as having a blade form in the assemblage and these were all made from milky quartz. It is likely that flakes with these forms, blade or elongated, were either manufactured into backed tools and removed from the site for later use as replacement parts. However, non-retouched quartz flakes were also used as hafted inserts (Hayden 1973: 125).

Crystal quartz was also flaked. As crystals were typically small the resulting flakes are also small. Some of the flakes still retain crystal facets on their dorsal surface. The complete flakes of crystal quartz are generally very small (mean axial length is 13.8 mm) with the largest flake being 31.9 mm in maximum length. These artefacts have little cortex reflecting the form of the material.

Form	<i>Crystal Quartz</i>				<i>Milky Quartz</i>			
	Count	%	Mean Length (mm)	Std Dev.	Count	%	Mean Length (mm)	Std Dev.
Bipolar					9	3.1	21.8	8.5
Blade					3	1.0	29.2	0.3
Block					71	24.1	28.2	12.4
Crystal	4	8.2	17.8	10.0				
Elongated	26	53.1	15.1	2.9	62	21.1	20.2	6.0
Expanding	8	16.3	9.9	2.5	48	16.3	16.3	6.8
Indeterminate	10	20.4	13.1	5.0	87	29.6	19.5	6.8
Platform	1		9.0		14	4.8	25.8	9.3
Rejuvenation		2.0						
Total	49		13.9	4.8	294		21.7	9.4

Table 10 Form of the complete flakes in the OMPS assemblage

Evidence of bipolar flaking is seen in the crushed terminations (n=32), crushed platforms (n=102), a bipolar form (n=9). The variable quality (i.e., internal flaws) of the available milky quartz, and as the size of the core decreases, sees the need for bipolar flaking. That flakes were removed from the entire core face is also seen in the presence of abrupt terminations (Table 11). The flaked platforms indicate irregular platform surfaces indicative of core rotation rather than clear flake scars. The presence of missing platforms is also a characteristics of a milky quartz assemblage which again reflects its flaking properties. Most of the complete flakes have no cortex but if present it is typically from a primary outcrop and on the platform (Table 11).

	<i>Crystal Quartz</i>		<i>Milky Quartz</i>	
	Count	%	Count	%
Cortex %				
0%	35	71.4	210	71.4
1-25%	6	12.2	60	20.4
26-50%	3	6.1	11	3.7
51-99%	1	2.0	9	3.1
100%	4	8.2	4	1.4
Total	49		294	
Cortex Type				
Facet	6	12.2	3	1.0
Orange/flaw	1	2.0	5	1.7
Rough	3	6.1	36	12.2
Water-rolled			1	0.3
Weathered	4	8.2	40	13.6
Distal End				
Abrupt	6	12.2	35	11.9
Cortical	1	2.0	8	2.7
Crushed	4	8.2	28	9.5
Facet	2	4.1	3	1.0
Feather	36	73.5	208	70.7
Hinge			4	1.4
Platform			2	0.7
Step			6	2.0
Platform Type				
Cortical	3	6.1	28	9.5
Crushed	21	42.9	77	26.2
Flaked	4	8.2	29	9.9
Missing	2	4.1	14	4.8
Unifacial	19	38.8	146	49.7

Table 11 Characteristics of the complete flakes made from milky quartz in the OMPS assemblage

Other Raw Material Types

An additional four raw material types were also used to make complete flakes in the project area (Table 12). All these raw materials were mostly acquired from a secondary source i.e. a waterway. The mean size of the flakes is relatively small with the exception of the one volcanic artefact and the silicified wood and tuff artefacts. These artefacts may have been acquired elsewhere, transported and discarded on-site.

<i>Material</i>	<i>Colour</i>	<i>Form</i>	<i>Axial Length (mm)</i>
CCQ	Black	Expanding	14.6
	Grey	Indeterminate	36
	Red	Indeterminate	16.5
	Grey	Platform	54.4
	Red	Platform rejuvenation	29.4
Chalcedony	Grey	Elongated	14.5
	Grey	Elongated	16.7
	Grey	Expanding	13.3
Silicified wood	Grey	Elongated	30.2
Tuff	Grey	Elongated	30.4
Volcanic	Black	Indeterminate	21.8
	Brown	Indeterminate	34.6
	Light grey	Expanding	11.1
	grey	Expanding	21.8
	Light grey	Indeterminate	13.3

Table 12 Characteristics of the complete flakes made from other raw materials in the OMPS assemblage

Tools

A total of only nine tools were found in the excavated squares and four tools of these were found on the surface (Table 13). Most of these tools were made on complete flakes. The complete tools are significantly larger than the unretouched complete flakes indicating a selection for size (complete flakes=20.6±9.3 mm, complete tools=30.4±7.4 mm; t=2.770, df=364, p=0.0059). Due to the hardness of milky quartz and crystal quartz (Mohs hardness of 7) it is difficult to flake and retouch. However, it retains a harder edge when used as a tool. In this respect the identification of use wear is sometimes difficult as edges are retained during use and rarely retouched. Larger milky quartz flakes may well have been tools but were not identified even under x10 magnification. Previous use wear studies in Australia suggests that some of the unretouched milky quartz artefacts were likely to have been used as tools (Irish 2010: 100). For example, bipolar cores were shown to have been used for cutting shell and plant matter.

Compared to the overall composition of the assemblage a variety of raw materials were used to make tools (Table 13). Nearly all of the tools were found in Transect 5 with two scarpers found in T5P8.

Various types of scarpers were the dominate retouch type (Table 13, Figure 7). One, tool (id=82) of chalcedony was retouched in two quadrants. Tools were generally made on large flakes that were either platform rejuvenation flakes or blocky in form (Figure 8). One tool (id=197) was used as a core and not a made on a flake. Id=471 and 456 may also have been used as cores. As already noted, no backed artefacts were found. However, a burin (id=114) made from tuff was found in T5P1 of Transect 5 (Figure 7).

A fragment of a grinding stone, also used as a core, was found in T22P1 (Figure 9) and another in T11P2.

<i>Id</i>	<i>Square</i>	<i>Tool Type</i>	<i>Material</i>	<i>Fragmentation</i>	<i>Form</i>	<i>Length</i>
106	T5P1	Use wear	CCQ	Complete Tool	Platform rejuvenation	39.7
188	T5P8	Straight scraper	Crystal Quartz	Complete Tool	block	20.4
197	T5P2	Straight scraper	Crystal Quartz	Broken Tool (core)	n/a	27.4
471	T4P16	Step scraper	Chalcedony	Broken Tool (possible core)	block	43.6
82	T5P4	Notch	CCQ	Complete Tool	Platform rejuvenation	41.6
456	T4P13	Denticulate	Milky Quartz	Complete Tool (possible core)	block	44.8
170	T5P8	Convex scraper	Crystal Quartz	Complete Tool	Indeterminate	26.2
114	T5P1	Burin	Tuff	Complete Tool	block	39.2
500	T6P2	Straight scraper	Red CCQ	Complete Tool	block	41.7

Table 13 Characteristics of the tools in the OMPS assemblage

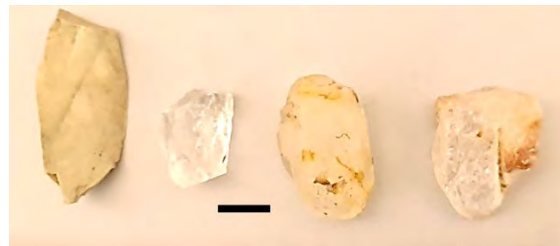


Figure 7 Tools found in the OMPS assemblage, Transect 5. Left to right, id=114, id=188, id=197, id=170 (scale=1cm)



Figure 8 Large scraper and notch tools found in the OMPS assemblage. Left to right, id=456, id=471, id=82 (scale=1cm)



Figure 9 Fragment of grinding stone also used as a core from T22P1, id=71 (scale=1cm)

Conjoin Analysis (Refitting)

No conjoins were found in the assemblage. As already noted, concentrations of distinctive raw materials were found (Table 6).

Spatial Distribution and Site Occupation

To examine whether spatial differences in reduction activities occur in the project area the location of the cores, tools, raw material colour and flake form were compared. Further details on the nature and behaviour of the activities at each of these locales is outlined below. However, only two locations represent greater discard activity: T7P1 and Trench 5.

Specific Areas of Raw Material Procurement

As noted previously concentrations of milky quartz and crystal quartz were found in T7P1. The numbers of artefacts in this square dominate the assemblage. The highly fragmented nature of the assemblage reflects not only the physical properties of the quartz but also its abundance.

Specific Activity Areas

While few tools were found in the assemblage the highest concentration was found in Transect 5. These tools include various scrapers and notched tools usually more indicative of a short-term, transient occupation site. A wider variety of raw material types was also found in this transect.

Archaeological Potential and Comparative Analysis

The aim of this investigation is to better understand the significance of the archaeological deposit recovered from the project area in 2022. Limited archaeological work has been undertaken in the region. A report by the Queensland University Archaeological Services Unit (1993) along the Styx and Walcha-Nundle Rivers found 187 artefacts from 44 locations with a maximum artefact density of seven. These artefacts were mainly broken flakes (n=40), flaked pieces (angular fragments, n=24) and includes 19 cores (Davies 1993: 54). Along the Styx River most of the artefacts (38%) were made from milky quartz and crystal quartz (12%) (Davies 1993: 55).

As only 5% of the artefacts had cortex, they concluded that the source of the stone was not located nearby (Davies 1993: 55). However, this conclusion may simply reflect the use of an outcrop i.e. an exposed vein of quartz.

Summary

It is now possible to return to the questions posed in the research design.

Site chronology. When was the site occupied? Was the assemblage the product of repeated occupations or a single event? Does any spatial patterning occur in the assemblage?

The site was occupied between c.5,000BP to contact based on the raw material use and tool types (i.e. the increase in milky quartz artefacts, atypical burin-blade cores and blades, all known to occur during this period). Generally, a higher frequency of milky quartz artefacts is generally associated with a late-Holocene occupation (Attenbrow 2002: 115-159). However, in this project area it also reflects the limited availability of other raw material types immediately available and hence milky quartz was working intensively.

It is likely that occupation was short-term, single events with limited food processing and tool manufacture. Different areas of tool use and raw material types are dispersed across the project area. Few processing tools (scrapers, use wear, notched) were found in the assemblage that are typically more indicative of a longer-term occupation. The exception is T7P1 which appears to be a stone procurement site (quarry) with large numbers of broken artefacts discarded.

Source Information. Which raw material resources were used?

The excavated assemblage was dominated by milky quartz artefacts that represents 85.3% (n=2017) of the assemblage. From this component of the assemblage, one location dominated – the reduction of cores producing angular fragments and flakes at T7P1. At this location it is likely a thick vein of macrocrystalline milky quartz was exposed. Pockets of crystal quartz were present in cavities within the milky quartz vein, and these were also extracted and worked with smaller quartz crystals were also discarded. Due the abundance of milky quartz little care was taken in working the cores with few flakes removed from the cores. It is possible that the region is 'lithic poor' and hence, T7P1 represents a location that was repeatedly visited to acquire stone. The physical properties of quartz also creates a highly fragmented assemblage with many broken flakes and angular fragments. The quartz found at T7P1 is highly brittle and has internal flaws resulting in further breakages.

Limited use of other sources was seen in the presence of volcanic, tuff and CCQ with a water-rolled cortex. One water-rolled cobble was reduced in Trench 5. This cobble graded from CCQ to MCQ.

In this T7P1 and T8P2, T13P5, T13P6, T14P2, T21P1, T22P1 and T23P1 complete and broken fragments of quartz crystals were also found (n=69). The distribution of these suggests that they were transported from the source at T7P1 and possibility used as tools.

Stone reduction technology. How was the stone worked and used? Can the function of the site be inferred from the artefact assemblage?

Flexibility was required to flake the available raw materials either due to their poor quality and high failure rates (crystal and milky quartz). Overall, a low number of cores were found relative to the number of complete flakes.

Fragmentation of the milky artefacts during manufacture is also shown by the high number of broken artefacts made from milky quartz. These artefacts were broken during manufacture along internal fracture lines. The size of the discarded core was then dependent on the homogeneity (lack of internal flaws) of the material and platform angles. Milky quartz, surprisingly, was used to manufacture elongated flakes that could potentially be backed to manufacture Bondi points and geometric microliths. Witter (1992: 43-44, 57) proposed that in some regions systematic and controlled reduction of macrocrystalline quartz was common and used to produce the elongated flakes needed for backed artefact manufacture (e.g. geometric microliths); and this assemblage appears to conform with this view. He identified two strategies for reducing cores to produce elongated flakes from pebbles - a steep platform blade core, using free-hand percussion on larger cores (> 60 g), or a bipolar blade core, reducing elongated cores of at least 50 mm in length with a faceted platform and a flat base that was anvil-rested. This latter method tends to be used on cores made on a flake. The milky quartz at T7P1 rarely flaked conchoidally. Another characteristic of the OMPS assemblage is the number of complete splits made from milky quartz. Complete flakes of milky quartz were split accidentally when using a bipolar technique to reduce cores. These flakes, platform rejuvenation flakes and blocky flakes concentrated in T7P1.

In general, more effort it required to manufacture elongated flakes from milky quartz as the failure rate is greater; more cores are needed, as cores fragment, and less flakes removed from each. These costs are mitigated by the advantages of using a raw material with a strong and sharp working edge, which lasts longer and requires less resharpening or replacement. In addition, the abundance of this material at T7P1 allows flexibility in manufacture. The abundance of raw material also allows expediency in flaking i.e. little care was taken to maximise the use of the available material.

Evidence for 'systematic' reduction of cores occurred on site (i.e. the manufacture of elongated/blade flakes from prepared cores). The presence of atypical burin-blade cores represents a systematic core reduction similar to the Redbank A strategy observed by Hiscock (1993) in the Hunter Valley. This strategy was also indicated by a number of other artefact characteristics e.g. flakes with a blade/elongated form. Smaller cores represent a late-stage failure and discard while larger cores were discarded due to internal flaws and high platform angles. Cores were made on flakes and more commonly angular fragments extracted from the outcrop. Rarely were cores made on water-rolled nodules.

Few tools were found in the assemblage. The tools are dominated by various types of scrapers.

Site Function. What types of activities occurred on-site/s? Do discrete areas of stone working occur? Can site function be related to environmental factors i.e. distance to sources?

T7P1 can be considered a stone source or quarry.

The overall low frequency of other processing tools types (e.g. use wear, notched and scraper) suggests that this location was not occupied for a long duration but rather a more transient use. However, it must be noted that unretouched flakes of milky quartz may have been used as unretouched tools. Due to the hardness of this material use wear damage could not be identified with x10 magnification. Numerous examples of large complete flakes of milky quartz appear to be the ideal size and shape for a tool. It is likely that the number of processing tools in the assemblage is considerably higher. However, with the exception of T7P1, the artefact density is low. Tools tend to concentrate in Transect 5 and may indicate a longer occupation.

Regional Comparative Analysis. How does this site compare with others in the surrounding region?

It appears a relatively low density of artefacts was found in the wider region. Along the Styx River the assemblage was dominated by milky and crystal cortex artefacts.

Post-depositional influences. What post-depositional influences have impacted on the assemblage?

Differences between surface and the upper spits may be due to post-depositional processes, such as bioturbation, resulting in smaller artefacts found within the excavated assemblage in Spit 4.

Conclusion

The assemblage excavated from transects along the Macleay River is dominated in number and weight by milky quartz artefacts in T7P1. Artefacts in this test square account for over 85% of the total assemblage. Little care was taken in the extraction and manufacture of flakes due to the abundance of raw material at this location. Broken flakes and angular fragments account for the bulk of the artefacts in this square (84.0%). The additional presence of cortical rubble and complete and broken crystal quartz fragments indicate that this location is a primary source or quarry. These are considered by-products of material extraction.

The characteristics of the cores, flakes and tools in the assemblage indicates that cores were procured and worked in two ways moving from freehand percussion to bipolar as core reduction continued. The use of a bipolar technique is dictated by the size of the cores and reflected in the presence of crushed platforms, crushed terminations and split flakes of milky quartz. In addition, due to the physical nature (internal flaws) of this material the assemblage is highly fragmented. Limited evidence for systematic core preparation was also found. However, it appears that one aim of core reduction was to manufacture elongated flakes. The presence of blades and atypical burin-blade cores suggests that the site was occupied within the last 5,000 years. The low number of tools reflects the procurement of stone and early-stage core reduction and the physical properties of macrocrystalline quartz, which is rarely retouched as it maintains a strong, sharp working edge. Links can be made between transects based on distinctive material types and colours.

There is a low frequency of processing tools types (e.g. use wear, notched and scarper) which indicates a more transient occupation. Some spatial variation in occupation behaviours occur across the test excavation squares reflected in the concentrations of different raw material types and tools from Transect 5. It is likely that the macrocrystalline quartz outcrop at T7P1 is a source with ample raw material located in an area that is 'lithic poor' and hence, represents a location that was repeatedly visited to acquire stone.

This report provides some understanding of site chronology, raw material selection, core preparation and reduction strategies and tool manufacture that contributes to understanding the archaeology of a region. A research recommendation is suggested.

Future research opportunities

1. Understanding the Stone Sources

This project would benefit from a source survey for primary and secondary sources in the along the Macleay River to more fully understand the geoarchaeological context. In particular, it would be useful to identify the primary source of vein quartz near T7P1.

References

- Andrefsky, W. Jr. 1998. *Lithics: Macroscopic Approaches to Analysis*. Cambridge: Cambridge University Press.
- Attenbrow, V.J. 2002. *Sydney's Aboriginal Past. Investigating the Archaeological and Historical Records*, (1st ed, hardback). Sydney: UNSW Press.
- Boot, P. 1987. Trampling damage on stone artefacts – some experimental results. *Australian Archaeology* 24: 10-15.
- Cotterell, B. & Kamminga, J.1987. The Formation of Flakes. *American Antiquity*, 52: 675-708.
- Davis, S. J. 1993. An archaeological assessment of the state forest of NSW's Walcha-Nundle and Sytch River management areas. Unpublished report to Mitchell McCotter. University of Queensland Archaeological Services Unit Report: 232.
- Doelman, T. 2008. Time to Quarry: The Archaeology of Stone Procurement in Northwestern New South Wales, Australia. Archaeopress, Oxford: *B.A.R. International Series S1801*.
- Doelman, T., Torrence, R., Popov, V., Ionescu, M., Kluyev, N., Sleptsov, I., Pantyukhina, I., White P., & Clements, M. 2008. Source selectivity: An assessment of volcanic glass sources in the southern Primorye region, Far East Russia. *Geoarchaeology: An International Journal* 23: 243–273.
- Driscoll, K. 2010. Understanding quartz technology in early prehistoric Ireland. Ph. D. Thesis University College Dublin, UCD.

- Elston, R. G. 1990. A cost-benefit model of lithic assemblage variability. In R. G. Elston and E. E. Budy (eds), *The Archaeology of James Creek Shelter*, pp. 153-163. University of Utah Anthropological Papers No. 13, University of Utah Press, Salt Lake City.
- Gould, R. A. 1969. Puntutjarpa rockshelter: A reply to Messrs Glover and Lampert. *Archaeology and Physical Anthropology in Oceania* 4: 229-237.
- Knight, J. 1997. Vein Quartz. *The Journal of the Lithic Studies Society* 12: 37-56.
- Lapidus, D. F. 1990. *Collins Dictionary of Geology*. Glasgow: Harpercollins.
- Hiscock, P. 1988b. Prehistoric settlement patterns and artefact manufacture at Lawn Hill, Northwest Queensland. PhD dissertation, University of Queensland.
- Hiscock, P. 1993 Bondian technology in the Hunter Valley, New South Wales. *Archaeology in Oceania* 28: 65-76.
- Hiscock, P & Mitchell, S. 1993. *Stone artefact quarries and reduction sites in Australia: towards a type profile*. Canberra: Australian Government Publishing Service.
- Holdaway, S. & Stern, N. 2004. *Record in Stone; the study of Australia's flaked stone artefacts*. Canberra: Aboriginal Studies Press.
- Odell, G. H. 2003. *Lithic Analysis*. New York: Springer.
- Richardson, N. 1992. Conjoin sets and stratigraphic integrity in a sandstone shelter: Kenniff Cave (Queensland, Australia). *Antiquity* 66: 408-418.
- Seong, C. 2004. Quartzite and Vein Quartz as Lithic Raw Materials Reconsidered: A View from the Korean Palaeolithic. *Asian Perspectives* 43(1): 73-91.
- Tallavaara, M., Manninen M.A., Hertell E. & Rankama T. (2010). How flakes shatter: a critical evaluation of quartz fracture analysis. *Journal of Archaeological Science*, 37(2): 442-448.
- Way, A. 2017. Test-pitting and the detection of sub-surface sites: an example from Lake George, NSW. *Australian Archaeology* 83(1-2):1-10.