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Environmental Impact Statement – Appendix K: Aboriginal Cultural Heritage Assessment Report

Warragamba Dam Raising

Reference No. 30012078
Prepared for WaterNSW
10 September 2021

Appendix 1 – Archaeological Assessment Report

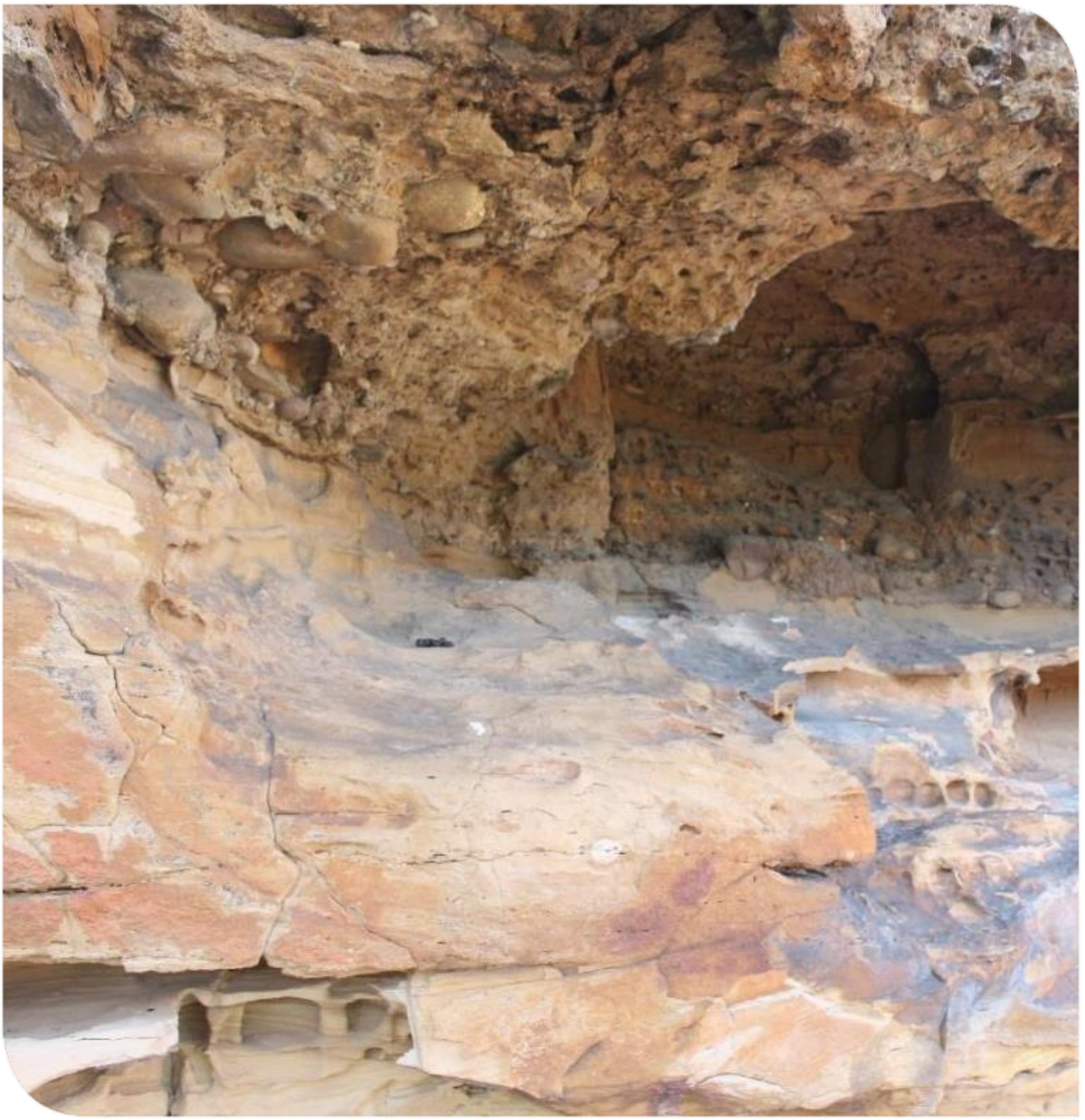
SMEC INTERNAL REF. 30012078

Excellence in your environment

Archaeological Assessment Report
Warragamba Dam Raising Project
Warragamba NSW

Wollondilly LGA
Prepared for SMEC Australia Pty Ltd
Author: Renée Regal

Prepared by Niche Environment and Heritage | 9 September 2021



Executive Summary

This Archaeological Report (AR) forms an appendix to the Aboriginal Cultural Heritage Assessment Report (ACHA Report) for the project and addresses the relevant Secretary's Environmental Assessment requirements (SEARs) for archaeological assessment. The Project is part of the Hawkesbury-Nepean Valley Flood Risk Management Strategy to reduce flood risk to life, property, and social amenities from floods in the Hawkesbury-Nepean Valley from now and into the future (Figure 1). The strategy announced by the NSW Government includes a number of infrastructure, policy and other planning actions to achieve this objective.

The Subject Area for this Archaeological Report includes the area potentially impacted by the construction of the project and the area that falls within the Existing Upstream Impact Area (EUIA) and the Project Upstream Impact Area (PUIA), and its immediate surrounds. The EUIA and PUIA have been derived through a probabilistic analysis of hypothetical flood events drawing on hydrological modelling carried out for the Project.

The EUIA is the area likely to be inundated with the existing dam and is defined as the area between Warragamba Dam up to RL 119.5 mAHD. The EUIA also takes in the area below full supply level (RL 116.7 mAHD) occupied by Lake Burragorang.

The PUIA is the area likely to be inundated with the Project and is defined by two contours:

- RL 119.5 mAHD – this is the level of likely inundation for the existing Warragamba Dam.
- RL 126.97 mAHD – this is the area of likely inundation with the proposed Project.

Proposed actions that would impact cultural heritage within the Subject Area include increasing the height of Warragamba Dam to create 'airspace' in a dedicated flood mitigation zone of around 14 m above the Full Supply Level of the dam. The Project would allow for temporary storage of floodwater but would not provide for more water supply storage. The Environmental Impact Statement (EIS) for the project is assessing the construction footprint and upstream impact area for the Project.

Niche was commissioned by SMEC to produce an ACHA in accordance with the SEARs which state that:

- The proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance
- Where archaeological investigations of Aboriginal objects are proposed, these must be conducted by a suitably qualified archaeologist, in accordance with Section 1.6 of the Code of Practices for Archaeological Investigation of Aboriginal objects in NSW (DECCW 2010). Consultation with Aboriginal people must be undertaken prior to investigations. Significance of cultural heritage values for Aboriginal people who have cultural association with the land must be documented in the EIS.
- Where impacts to Aboriginal objects and/ or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines
- Any objects recorded as part of the assessment must be documented and notified to Heritage NSW
- Where land is declared wilderness under the Wilderness Act 1987 or on the World Heritage List as part of the Greater Blue Mountains World Heritage Area (GBMWHA) and lands declared as Wild Rivers under the NPW Act and the proponent must*:*
  - Must define the area and extent of the impact on such lands
  - Provide evidence that the proposal is consistent with the Wilderness Act 1987 and the management principles for wilderness areas

- Access impacts on land to be included on the National Heritage List.

Further to this the following guidelines, were referred to as part of these SEARs:

- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW Department of Environment and Conservation [DEC] 2005a);
- Aboriginal cultural heritage consultation requirements for proponents 2010 (ACHCRs) (NSW Department of Environment, Climate Change and Water [DECCW] 2010a);
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b);
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010c);
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011);
- The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Australia International Council on Monuments and Sites [ICOMOS] 2013);
- Engage Early (Commonwealth Government, 2016); and
- NSW National Parks and Wildlife Regulation, 2019 (NPW Regulation).

A total of 22 separate Aboriginal stakeholders (including groups and individuals) have registered an interest in the Project's ACHA. Consultation with all of these parties has been ongoing through the development of the ACHA and AR reports.

In addition to comprehensive surveys of the Subject Area in line with the agreed methodology and additional meetings with the Aboriginal community, the ACHA and AR included a review of previous surveys and assessments from within the Subject Area and the surrounds. The results of the archaeological assessment are presented in this report and have been considered in ACHA when assessing the likely harm of the proposed activity on the Aboriginal objects present within the Subject Area.

A total of 43 Aboriginal heritage sites were identified within the PUIA part of the Subject Area, including 39 newly recorded sites and 4 previously recorded sites. The construction works will not harm any known Aboriginal sites. A number of the sites (n=183) have previously been impacted in the EUIA by the development of the dam and its Full Supply Level (FSL). Another 108 Aboriginal cultural heritage sites were located outside the PUIA and EUIA; 93 newly recorded sites and 15 previously recorded sites.

Statement of significance

A full statement of significance addressing cultural heritage values and associated significance as well as scientific (archaeological) significance is provided in the ACHAR. These statements of significance have been prepared following archaeological investigation and analysis carried out according to *the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), and utilising assessment criteria that reflect best practice assessment processes as set out in the Burra Charter.

Most sites (272 of 334) have been assessed to hold low scientific significance. There were 22 sites of moderate significance and a further 40 of high significance.

A list of Aboriginal sites in the Subject Area, their scientific significance rating and a statement of significance is presented in Table 54 of the AR, Annex 5 and a summary of scientific significance ratings is presented in Table 55 of the AR .

Based on the results of the survey it is assumed that the unsurveyed area within the Subject Area is likely to contain a similar level of Aboriginal objects, scientific and cultural significance as those areas that have been surveyed.

Based on the results of the survey it is assumed that the unsurveyed area within the Subject Area is likely to contain a similar level of Aboriginal objects, scientific and cultural significance as those areas that have been surveyed.

Impact assessment

The assessment of potential impact has been undertaken on the basis of the subject area.

There is the potential for increased impact within the EUIA through extended duration and increased depth of flooding events as a result of the Project. There is also the potential for impacts through temporary inundation above the PUIA during larger flooding events, however, the likelihood of this is much less than within the PUIA. The Project hydrological assessment and mapping that is relied upon in this report has been undertaken for WaterNSW by SMEC who have provided the relevant data and inundation modelling mapping layers for this report.

Impact was also assessed against an extreme and rare flood event, identified in the EIS as 'the event' which may not occur in physical life span of some types of heritage sites (E.g. scarred trees, ochre/charcoal artwork).

Of the 43 sites that would experience temporary inundation if an event were to occur, five (5) were considered to have high scientific (archaeological) significance, three (3) are considered to have moderate scientific (archaeological) significance and the remaining 35 sites were considered to have low scientific (archaeological) significance.

A number of the sites (n=183) have previously been impacted in the EUIA by the development of the dam and its Full Supply Level (FSL).

A single site was identified on the AHIMS within the construction area However during the process of the survey it was determined that the location of this site on AHIMS was not correct and was outside of the construction area.

Based on a predictive archaeological landscape model the PUIA is predicted to contain a total of 174 archaeological sites, comprised of 117 open sites with stone artefacts and 51 rockshelter sites and at least 3 other site types. The EUIA is predicted to contain 578 archaeological sites, again comprising mostly of open sites, at a predicted 458 open sites and 109 rockshelter sites and at least 11 other sites. Outside the EUIA and above the PUIA, in the zone of very low risk from the project, there are predicted to be 370 archaeological sites. The Registered Aboriginal Parties (RAPs) have advised through the submission process that all sites have high cultural significance. Further to this the majority of the RAPs consider the proposal to raise the Warragamba Dam wall; for the temporary storage of flood waters; as an unacceptable impact for the future preservation of tangible and intangible connections to their cultural landscape; and have called for an immediate stop to the project.

The Project is seen by the RAPs as a further accumulation of impacts to Aboriginal cultural heritage that has previously been affected by the original development of the Warragamba Dam.

Evaluation of management and mitigation measures

The Project will result in potential harm to identified sites of Aboriginal heritage, and potential harm to sites that may occur in areas within the Subject Area that have not been subject to archaeological survey. The harm involves infrequent temporary inundation with floodwaters for periods of up to 10 days. For these sites and areas that will be temporarily inundated with floodwaters there are no feasible avoidance options that can be implemented by the project. Some direct measures to mitigate harm to these sites has been presented in the ACHA. To further ameliorate these unavoidable impacts alternative measures that can positively influence ecologically sustainable development and intergenerational equity principles are suggested. These are indirect mitigation measures which include measures to contribute to intergenerational equity through increasing the broader community's knowledge of Aboriginal history in the Warragamba area, and improve the Aboriginal community's ability to access and manage the valuable archaeological and cultural resource that exists within and beyond the project's boundary. The indirect mitigation measures are presented in the recommendations.

The following recommendations were developed in response to the cultural and scientific (archaeological) values of the Subject Area and draw upon the principles of ecologically sustainable development and intergenerational equity. These principles state that "the present generation makes every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations".

Recommendations

1. An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed for the Project. The ACHMP should be developed and managed in consultation with the RAPs and relevant regulatory authorities. The ACHMP should include, but not be limited to the following:
    - Protocols for the involvement of the RAPs in cultural heritage investigations conducted under the ACHMP. A communications protocol that describes clear methods of communication, including expectations of suitable notification and response time, between the proponent and the RAPs.
    - Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
    - A regular review process for the ACHMP.
    - Warragamba-288 (AHIMS ID #pending) should be included within the ACHMP
2. To mitigate impacts from the project WaterNSW should contribute to the greater understanding and recognition of Aboriginal culture and history of the Warragamba area by:
    - Additional cultural heritage investigations within the upstream catchment and within the Subject Area (upstream catchment and impacted area), including additional archaeological survey of the entire EUIA and PUIA.
    - Recording of archaeological and cultural sites using techniques such as 3D scanning and photogrammetry
    - Provision of material to assist and support the National Heritage Listing (NHL) and World Heritage List (WHL) listing attempts
    - Considering opportunities for the Aboriginal community to be involved in the management of cultural sites and the landscape.

- Highlighting traditional and historical Aboriginal heritage of the Warragamba area to the wider community through displays and interpretation at suitable locations, including but not limited to phone applications– this information should be prepared with the assistance and endorsement of the RAPs.
- Highlighting traditional and historical Aboriginal heritage of the Warragamba area through establishing and facilitating educational sessions focusing on Aboriginal heritage for school students in Warragamba – preparation and delivery of these should involve Elders endorsed by the RAPs.

3. Prior to the operation of the Project; WaterNSW will review its assessment processes for works within the upstream catchment to include awareness to personnel undertaking an activity on its behalf of any potential Aboriginal cultural heritage values and objects in the area.

4. Protocols for heritage awareness training to be incorporated into the site inductions for both employees and sub-contractors involved in the construction of the Project, operation of the dam and activities in the catchment of Lake Burragorang. Registered Aboriginal Parties should be involved in the development and presentation of the cultural awareness training.

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1. Introduction

This report presents the Archaeological Report (AR) for the Warragamba Dam Raising Project (the Project).

WaterNSW, an NSW state owned corporation, is seeking project approval for the Warragamba Dam Raising Project (the Project). This report presents the findings of an AR for the project addressing the relevant Secretary's Environmental Assessment requirements (SEARs).

Niche was commissioned by SMEC Australia Pty Ltd (SMEC) on behalf of WaterNSW to produce an Aboriginal Cultural Heritage Assessment Report (ACHAR) and an Archaeological Report (AR) in accordance with the SEARs and following guidelines:

- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (NSW Department of Environment and Conservation [DEC] 2005a);
- Aboriginal cultural heritage consultation requirements for proponents 2010 (ACHCRs) (NSW Department of Environment, Climate Change and Water [DECCW] 2010a);
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b);
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010c);
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011);
- The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (Australia International Council on Monuments and Sites [ICOMOS] 2013);
- Engage Early (Commonwealth Government, 2016); and
- NSW National Parks and Wildlife Regulation, 2019 (NPW Regulation).

Approval for the Project will be sought under Division 5.2 of Part 5 of the NSW *Environmental Planning and Assessment Act 1979 (*EP&A Act) as the project is State Significant Infrastructure. The Secretary's Environmental Assessment Requirements (SEARs) for the Project were initially issued on 30 June 2017 – and were subsequently re-issued on the 13 March 2018. With regard to Aboriginal heritage, the SEARs state the following:

The Proponent (WaterNSW) must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:

- Aboriginal places and objects, as defined under the National Parks and Wildlife Act 1974 and in accordance with the principles and methods of assessment identified in the guidelines;
- Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;
- Environmental heritage, as defined under the Heritage Act 1977; and
- Items listed on the National and World Heritage lists.

The objective of this AR is to identify whether evidence of Aboriginal sites, objects or places are present within the Subject Area (defined in Section 3.1.4) and if present, determine whether these would be impacted by the proposed works and provide appropriate mitigation and management recommendations. In consideration of the SEARs and the requirements of the above guidelines and regulations, are as follows:

- Identify and describe Aboriginal objects located within the Subject Area
- Identify and describe the sensitivity (in relation to cultural heritage) of different landforms present within the Subject Area.

- Identify and describe the scientific heritage values, including the significance of the Aboriginal objects that exist across the whole area that will be affected by the Project.
- Identify and describe the actual or likely harm posed to Aboriginal objects or declared Aboriginal places from the Project with references to the scientific values identified.
- Provide a description of any practical measures that may be taken to protect and conserve those Aboriginal objects.
- Provide a description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or if this is not possible, to manage (minimise) the harm.
- Provide recommendations for the conservation of archaeological values and measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or if this is not possible, to manage (minimise) the harm.

The Project site is located approximately 65 km west of the Sydney Central Business District in the Wollondilly Local Government Area (LGA). To the west of the Project site are the Blue Mountains and various National Parks and State Conservation Areas which make up the catchment of Lake Burragorang - which is the water storage formed by Warragamba Dam. To the east of the Project site is the Warragamba and Silverdale townships and surrounding rural residential areas.

The Project is part of the Hawkesbury-Nepean Valley Flood Risk Management Strategy to reduce flood risk to life, property and social amenities from floods in the Hawkesbury-Nepean Valley from now and into the future (Figure 1). The strategy announced by the NSW Government includes a number of infrastructure, policy and other planning actions to achieve this objective. Proposed actions that would impact cultural heritage within the Subject Area include increasing the height of Warragamba Dam to create 'airspace' in a dedicated flood mitigation zone above the Full Supply Level of the dam (RL 116.7 mAHD).

The Project allows for temporary storage of floodwater but does not provide for more water supply storage.

2. Investigators and Contributors

2.1 Research and Reporting

This investigation was managed by Renée Regal (BA Hons), Niche Discipline Manager-NSW Heritage, who has 16 years of experience as a professional archaeologist and heritage consultant. The following team members assisted with various components of the project and assessment:

Aboriginal community consultation, research, field assessment and report writing were conducted by:

- Renée Regal
- Sam Richards (BA Hons) who has 7 years' experience as a professional archaeologist and heritage consultant.

The following team members assisted with the field assessment:

- Michael Jackson (BA Dip. Indigenous Studies) of Jackson Ward Archaeology Services, professional archaeologist with 20 years of experience
- Samuel Ward (BA Hons), professional archaeologist and heritage consultant with 3 years of experience
- James McGuiness (BA Hons), professional archaeologist with 13 years of experience

2.1 Contributors to Assessment

The following team members assisted with the report writing for this assessment:

- Dr Morgan Disspain (PhD B. Arch. Hons), professional archaeologist and heritage consultant with 12 years of experience
- Isabel Tickle (BArch), professional archaeologist and heritage consultant with 5 years of experience
- Samuel Ward (BA Hons), professional archaeologist and heritage consultant with 3 years' experience
- Wade Goldwyer (BA Hons), professional archaeologist and heritage consultant with 4 years of experience

The contributors to this Archaeological Report and their project roles are listed in Table 1.

Table 1: Contributors, affiliations, and contributions

Contributor	Affiliation	Contribution	Qualification
Renée Regal	Niche	Project Director, Author and internal Q and A	BA (Hons)
Sam Richards	Niche	Archaeological field assessment	BA (Hons)
Michael Jackson	Jackson Ward Archaeology	Archaeological field assessment	BA Dip.
James McGuinness	Niche	Archaeological field assessment	BA
Samuel Ward	Niche	Archaeological field assessment, report contributor	BA (Hons)
Dr Morgan Disspain	Niche	Report contributor	PhD B. Arch. (Hons)
Isabel Tickle	Niche	Report contributor	B. Arch
Wade Goldwyer	Niche	Report contributor	BA (Hons)
Jamie Reeves	Niche	Internal review	(BA Hons)

Contributor	Affiliation	Contribution	Qualification
Tori Stening	Unearthed Archaeology	Peer review	BA, MA
Steven Hickey	A1 Indigenous Services; Amanda Hickey Cultural Services; Widescope Indigenous Corporation	Registered Aboriginal Party, field survey	
Nick Deswalt	A1 Indigenous Services; Amanda Hickey Cultural Services; Widescope Indigenous Corporation	Registered Aboriginal Party, field survey	
Mike Skinner	Corroboree Aboriginal Corporation	Registered Aboriginal Party, field survey	
Adam King	Corroboree Aboriginal Corporation; Murra Bidgee Mullangari Indigenous Corporation	Registered Aboriginal Party, field survey	
Daniel Chalker	Cubbitch Barta Native Title Claimants	Registered Aboriginal Party, field survey	
Rebecca Chalker	Cubbitch Barta Native Title Claimants	Registered Aboriginal Party, field survey	
Ebony Chalker	Cubbitch Barta Native Title Claimants; Gundungurra Aboriginal Heritage Association Inc.	Registered Aboriginal Party, field survey	
Jade Paton	Darug Custodian Aboriginal Corporation	Registered Aboriginal Party, field survey	
Chris Halls	Gundungurra Aboriginal Heritage Association Inc.	Registered Aboriginal Party, field survey	
Keiran McNailly	Gundungurra Aboriginal Heritage Association Inc.	Registered Aboriginal Party, field survey	
Sharyn Halls	Gundungurra Aboriginal Heritage Association Inc.	Registered Aboriginal Party, field survey	
Robert Hunter	Kamilaroi Yankuntjatjara Working Group	Registered Aboriginal Party, field survey	
Jamie Currell	Kamilaroi Yankuntjatjara Working Group	Registered Aboriginal Party, field survey	
Kachibulla Khan	Kamilaroi Yankuntjatjara Working Group	Registered Aboriginal Party, field survey	
Chad Carroll	Murra Bidgee Mullangari Indigenous Corporation	Registered Aboriginal Party, field survey	
Ryan Johnson	Murra Bidgee Mullangari Indigenous Corporation	Registered Aboriginal Party, field survey	
Chad Gowan	Murra Bidgee Mullangari Indigenous Corporation	Registered Aboriginal Party, field survey	

In addition to the RAPs listed in Section 5.2.3.3, the individuals listed in Table 2 attended and/or supported the surveys and assessment in various capacities.

Table 2: Aboriginal cultural heritage surveys and assessment – other participants or support personnel

Name	Representing
David Harper	WaterNSW
Kate Kernaghan	WaterNSW
Emma Hately	WaterNSW
Jonas Ball	SMEC
Morgan Disspain	Niche
Wade Goldwyer	Niche
James McGuiness	Niche

Name	Representing
Jamie Reeves	Niche
Isabel Tickle	Niche
Samuel Ward	Niche
Michael Jackson	Jackson Ward Archaeology Services
Tory Stening	Unearthed Archaeology
Kate Waters	Waters Consultancy

3. Description of Development Proposal

This Section describes the proposed Warragamba Dam Raising project, including the key proposal elements, ancillary facilities, design standards and construction activities and highlights activities that have the potential to harm Aboriginal objects.

3.1 The Project

3.1.1 Proposed activities

The Project site is located approximately 65 km west of the Sydney Central Business District in the Wollondilly Local Government Area (LGA). To the west of the Project site are the Blue Mountains and various National Parks and State Conservation Areas which make up the catchment of Lake Burragorang - which is the water storage formed by Warragamba Dam. To the east of the Project site is the Warragamba and Silverdale townships and surrounding rural residential areas. The Project is to raise the dam wall at Warragamba Dam to create a Flood Mitigation Zone of 14 metres and upgrade associated infrastructure.

The Project is part of the Hawkesbury-Nepean Valley Flood Risk Management Strategy to reduce flood risk to life, property and social amenities from floods in the Hawkesbury-Nepean Valley from now and into the future (Figure 1). The strategy announced by the NSW Government includes a number of infrastructure, policy and other planning actions to achieve this objective. Proposed actions that would impact cultural heritage within the Subject Area include increasing the height of Warragamba Dam to create 'airspace' in a dedicated flood mitigation zone above the Full Supply Level of the dam (RL 116.7 mAHD).

The Project allows for temporary storage of floodwater but does not provide for more water supply storage.

Key proposal elements including ancillary facilities, design standards and construction activities are outlined below:

- Enable the dam to capture and temporarily hold back inflows from the Lake Burragorang catchment behind the wall
- Provide capacity to facilitate flood mitigation by increasing the crest levels of the central spillway by approximately 12 metres and increasing the dam abutments (including access road) by 17 metres which includes approximately three metres to be resilient to the future impacts of climate change
- Provide infrastructure to allow for environmental flows to be released from Warragamba Dam.

The Project would include the following main activities and elements:

- Demolition;
- thickening and raising of dam abutments;
- thickening and raising of central spillway;
- modifications to the auxiliary spillway;
- other infrastructure and elements; and,
- environmental flow infrastructure.

Figure 4 shows the construction footprint which includes temporary construction facilities and areas that would be disturbed by construction. The operation of the project would have impacts upstream of Warragamba Dam (Figure 2 and Figure 3). The operational impacts and benefits of the project downstream of Warragamba Dam would include the Warragamba River, the Hawkesbury-Nepean River and its floodplain and some of the tributaries of the Hawkesbury-Nepean River (e.g. South Creek) which

experience backwater impacts from the flooding of the river. Upstream operational impacts of the project would include the Lake Burragorang catchment and tributaries which flow into Lake Burragorang. This includes areas of National Parks, State Conservation Areas and the Greater Blue Mountains World Heritage Area.

3.1.2 Site Location and Study Area

Warragamba Dam is located approximately 65 kilometres west of Sydney in a narrow gorge on the lower section of the Warragamba River, 3.3 kilometres before it joins the Nepean River. The township of Warragamba is located approximately one kilometre east of the dam wall. The upstream environment includes the reservoir formed by Warragamba Dam (Lake Burragorang) and its tributaries. The dam catchment covers an area of approximately 9,050 square kilometres, of which approximately 75 square kilometres is occupied by Lake Burragorang. The catchment includes state conservation areas, national parks, and parts of the Greater Blue Mountains World Heritage Area (GBMWHA). Lake Burragorang and its catchment area are shown on Figure 1.

The dam was constructed between 1948 and 1960 in a narrow sandstone gorge of the Warragamba River. The flooded gorge is now called Lake Burragorang, an Aboriginal name meaning 'a tribe which lives in a valley where there is plenty of game' (Shaw 1984). Surrounding Lake Burragorang are the water catchment Special Areas extending to the Blue Mountains and the Southern Tablelands.

Upstream of Warragamba Dam are two major river systems that drain into the reservoir, the Coxs River and the Wollondilly River. A major tributary of the Coxs River is the Kowmung River. Other tributaries within the Project area are Kedumba Creek, Butcher Creek and Green Wattle Creek. A major tributary of the Wollondilly River is the Nattai River with smaller associated streams such as the Tonalli River, Byrnes Creek and Jooriland Creek. Downstream of Warragamba Dam, the Warragamba River flows into the Nepean River through Penrith. North of Penrith the river becomes the Hawkesbury River and continues downstream to Berowra Creek and the Brooklyn Bridge.

The study area and specific areas of investigation adopted for the Aboriginal cultural heritage assessment (refer Appendix K, EIS) are described in the following table.

Table 3: Definition of key areas for the archaeological assessment

Area	Definition/Comment
Upstream study area	Defined as the area between Full Supply Level and the probable maximum flood[1] (PMF) event with the Project. The size of the area between Full Supply Level (RL 116.7 mAHD) and the Project PMF is about 5,280 hectares. Of this, about 2,935 hectares is affected by the existing PMF. The area of Lake Burragorang at FSL is about 75 square kilometres. Archaeological surveys were undertaken within the upstream study area, as well as adjoining areas outside of the upstream study area.
Construction study area	The area around Warragamba Dam where construction activities would occur, and about 105 hectares in size. About 33 hectares of vegetation would be cleared for construction.
Downstream study area	Defined by the existing PMF which will reduce in size due to the Project. The extent of other downstream flood events of a specific frequency of occurrence will also reduce due to the Project.

Area	Definition/Comment
	Any previously recorded Aboriginal sites that have been identified do not require impact assessment, noting that those sites in the floodplain will have been subject to inundation from past flood events.
Existing upstream impact area (EUIA)	The area that includes Lake Burragorang and up to 2.8 m (RL 119.5 mAHD) above Full Supply Level. This is the area inundated by the existing dam. The EUIA (and PUIA) has been derived through a probabilistic analysis of hypothetical flood events drawing on hydrological modelling carried out for the Project.
Project upstream impact area (PUIA)	The area between 2.8 m (RL 119.5 mAHD) above FSL and 10.3 m (RL 126.97 mAHD) above FSL. This is the additional area above the EUIA most likely to be inundated by the Project (based on the hydrological modelling noted above). The size of the PUIA is about 1,401 hectares.
Subject area	This area comprises: • the construction study area • the PUIA • the area above the PUIA within the upstream study area
Survey area	This covers the extent of archaeological site surveys. Upstream of Warragamba Dam this covered a total area of 2,655 hectares. This comprised: • 1,436 hectares within the Upstream Study Area (including 464 hectares of the PUIA) • 1,219 hectares outside of the Upstream Study Area was surveyed (including below FSL and outside of PMF). The survey area included the Construction study area.

1 The PMF is a hypothetical flood estimate relevant to a specific catchment whose magnitude is such that there is negligible chance of it being exceeded. It represents a notional upper limit of flood magnitude and no attempt is made to assign a probability of exceedance to such an event (*Australian Rainfall and Runoff*, Ball *et al*. 2019). The PMF is unlikely to occur in nature given the size of the Warragamba Dam catchment.

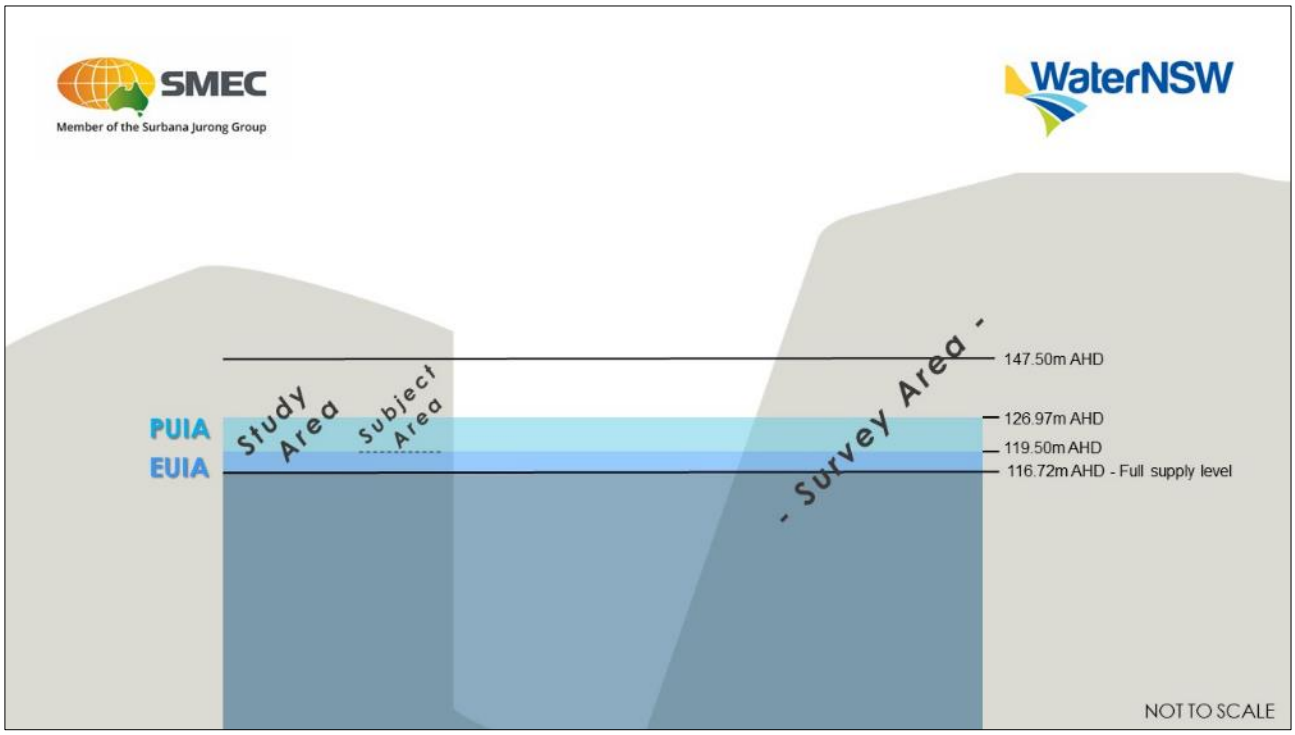


Diagram 1. Project areas discussed in the text

4. Previous Archaeological Work

4.1 Heritage Registers

4.1.1 Aboriginal Heritage Information Management System (AHIMS)

4.1.1.1 The Subject Area

Extensive searches of the Aboriginal Heritage Information Management System (AHIMS) were undertaken from 13 October 2017 to 8 November 2017 (AHIMS Client ID# 309309). A total of 55 [1] Aboriginal cultural heritage sites were identified within the Subject Area and the surrounding landscape (Figure 7, Figure 8, Figure 9 and Table 4). A revised search using the Subject Area shape files was completed on the 27 August 2019, a client ID number was not provided for this search however the AHIMS data was named search file 3531_Export_27082019. The results of this revised search remained the same as described in Table 4. It is important to note that the AHIMS search incorporated an area larger than the Subject Area and as a result produced a higher number of sites. The final number of sites within the Subject Area is listed in Table 58.

Table 4: Summary of AHIMS Aboriginal site types within the Subject Area and the surrounding landscape

Site features	Number	Percentage of all sites
Aboriginal Resource and Gathering	1	2%
Art (Pigment or Engraved)	1	2%
Artefact (Open Camp Site or Isolated Artefact)	44	80%
Burial	0	0%
Grinding Groove	3	5%
Modified Tree (Carved or Scarred)	6	11%
Shell	0	0%
Stone Quarry	0	0%
Water Hole	0	0%
Total	**55**	100%

4.1.1.2 Downstream to the Subject Area

The Project would not result in any negative impacts to Aboriginal cultural heritage downstream of Warragamba Dam. However, the downstream area is included in the data synthesis for an understanding of Aboriginal Objects and sites associated with Lake Burragorang downstream drainage channels (Table 5).

Downstream of the dam extensive AHIMS searches were conducted (AHIMS Client ID#311448, 311445, 311387, 311386, 311385, 311255, 311251, 311243, 311240, 311236, 311233, 311231, 311129, 311126, 311124, 311117, 311116, 311098, 311097, 311095, 311093, 311091, 309375, 309373, 309366, 309362, 309359, 309357, 309345, 309304, 309224, 309212, 309203, 309197, 309196, 309193, 309191 and 309181). A total of 887 archaeological or cultural sites were identified within the downstream of the Project.

The majority of the archaeological sites on the AHIMS are from studies undertaken by Brayshaw (1989), Hagland (1984) and Dallas (1982). Other small surface surveys relating to dam infrastructure or for urban

[1] A further two AHIMS sites are registered within the Subject Area, however these could not be relocated during the assessment as they have been recorded in the wrong location on AHIMS. Byrnes Creek (AHIMS ID#52-1-0008) and Folley Creek (AHIMS ID#45-5-0638). As a result, these sites have not been included in the final Aboriginal site number counts.

development on the periphery of the catchment have been undertaken by Brayshaw (1992 and 1999) and AHMS (2005).

Table 5: Summary of AHIMS Aboriginal site types within the downstream study area

Site features	Number	Percentage of all sites
Aboriginal Ceremony and Dreaming	1	<1%
Art (Pigment or Engraved)	32	4%
Art (Pigment or Engraved), Artefact	11	1%
Art (Pigment or Engraved), Artefact, Grinding Groove	2	<1%%
Art (Pigment or Engraved), Grinding Groove	9	1%
Art (Pigment or Engraved), Potential Archaeological Deposit (PAD)	1	<1%%
Artefact	663	75%
Artefact, Modified Tree (Carved or Scarred)	1	<1%%
Artefact, Grinding Groove	6	1%
Artefact, Potential Archaeological Deposit (PAD)	2	<1%
Grinding Groove	31	3%
Modified Tree (Carved or Scarred)	6	1%
Potential Archaeological Deposit (PAD)	116	13%
Shell	1	<1%
Stone Quarry	5	1%
Total	**887**	**100**

There are a number of limitations to the AHIMS dataset. These limitations include the following:

- the absence of reports identifying the survey coverage for a number of the previous surveys
- duplication of site recordings
- some datum and locational errors within the AHIMS dataset
- several Aboriginal sites which are known to be present within the Subject Area that were not yet added into the AHIMS database at the time of the search.

Where possible, corrections to site locations have been made and a revised Aboriginal site dataset for the Project has been created.

Other registers

he Australian Heritage Database was searched for items and places of Aboriginal cultural heritage and archaeological value.

The Greater Blue Mountains World Heritage Area (GBMWHA) is a declared place on the World Heritage List (WHL)(Place ID 105127). The GBMWHA is listed under the class *natural* and under natural heritage criteria on the WHL, but the listing also notes significant contributory values with regard to Aboriginal cultural heritage.

The GBMWHA is also a nominated place on the National Heritage List (NHL)(Place ID 105696), the nomination noting that it is "assumed that those values accepted as being universally outstanding are also outstanding at the national level." The nomination to the NHL includes the identification of further contributory values to the WHL listing, including Aboriginal cultural heritage values.

The GBMWHA and Aboriginal cultural heritage values associated with and contributing to its significance are discussed further in this report, in the Aboriginal Cultural Heritage Assessment Report, the Cultural Values Assessment Report and in World Heritage Assessment Report (Appendix J of the EIS).

A non-Aboriginal historical context of the Warragamba region, the greater Sydney region and an overview of Sydney's Water Supplies is provided in Section 3 of the non-Aboriginal heritage impact assessment (Artefact Heritage 2020). Where this is of relevance to the Aboriginal archaeological assessment these matters have been included in this report.

4.2 Previous Heritage Assessments within close proximity of the Subject Area

Archaeological studies provide material evidence of Aboriginal use of the landscape at times both before and after written history and complements the oral histories and cultural knowledge held by the Aboriginal community. As noted in Section 4.3.1, a number of archaeological investigations have been undertaken in or within close proximity to the Subject Area and are outlined in Table 6.

Table 6: Overview of previous local archaeological investigations

Assessment and date	Summary of findings
Brayshaw 1988: PMF Inundation of Archaeological Resources Warragamba EIS	Brayshaw was engaged by the Water Board to investigate the effects of a Probable Maximum Flood (PMF) downstream of Warragamba Dam. This form of inundation is predicted once every 10 000 to 100 000 years. 90% of the sites recorded within this zone were Open Camp Sites and occasionally hearths on the surface or in stratified deposits. Quarries were also found, with silcrete commonly extracted for the manufacture of stone tools. Other sources of stone included chert, quartz and basalt cobbles, occurring in the Nepean gravels. Other sites recorded in the zone included Axe Grinding Grooves, Scarred Trees, Stone Arrangements and Burials. Whilst the impact of flooding within the PMF zone was predicted to vary, it was hypothesised that archaeological deposits at open and shelter sites in some areas would be destroyed by scouring (similar examples of flooding have demonstrated the negative effects of water action on the archaeological contexts). Other open sites would be covered with sediment and protected from disturbance. Shelters, in comparison, could be de-stabilised with the deterioration of art. Axe Grinding grooves may be obscured by the deposition of silt and scarred trees drowned. Brayshaw concludes by highlighting the need for increased protection of sites by NSW NPWS.
Brayshaw 1989: Warragamba Dam – Archaeological study sample investigation of areas upstream to be affected by increased water retention	Brayshaw was engaged by the Water Board to undertake a sample survey of areas upstream of Warragamba Dam to be affected by increasing water retention for flood mitigation. During this assessment Brayshaw divided the Study Area into five separate landform areas -Jamison, Burrogorang and Warragamba were the landforms in which she concentrated her surveys as she identified that the remaining two Kowmung and Wombeyan landscapes steep terrain would have made them unsuitable for occupation. It should be noted that this project did not proceed Aboriginal site identified within the inundation zone included: Rockshelters with art and/or deposits, Axe Grinding Grooves, Open Camp Sites and Scarred Trees. Brayshaw noted that survey coverage needed to cover at least 30% of the impact zone in order to accurately determine the extent of Aboriginal cultural heritage sites. During this assessment Brayshaw identified 63 Aboriginal cultural heritage sites registered with the National Parks and Wildlife Service and a further 24 Aboriginal cultural heritage sites during the teams targeted survey effort. During the analysis of the artefacts at each of the sites identified Brayshaw noted that there were no ground edge axes present. With the majority of the stone tools present being made of mudstone or chert. The management outcomes from this survey were: 1) an appointment to the Water Board of an Archaeological Project Manager and assistant from the local Aboriginal community for 12-18 months to develop, on the basis of further investigation, a Plan of Management.

Assessment and date	Summary of findings
	2) A steering committee was to be appointed to oversee its implementation, which is likely to involve a 2-3 year salvage project. 3) Specialist studies of taphonomic and other processes associated with inundation were to be carried out, with significant input being provided by relevant University departments. Publication of associated reports and development of a museum display would provide public access to information gained. 4) An internal benefit would be the establishment of an archaeological management data base with policy and procedures for wider application within Government authorities concerned with water resource management. Unfortunately none of these management outcomes were undertaken by the then Water Board, which has led to some of the issues the Project is facing.
Brayshaw 1992: Warragamba Dam EIS – Spillway archaeological survey for Aboriginal sites	Brayshaw conducted an archaeological survey and archaeological assessment of a proposed auxiliary spillway on the eastern side of Warragamba Dam. No evidence of Aboriginal occupation was identified during the survey. Subsequently, no constraints were identified for the proposed development and no further archaeological investigations were required.
Brayshaw & McDonald 1995: Archaeological Survey at Jerry 's Creek Bridge, near Wallacia, Southern Cumberland Plain, NSW	HLA Envirosciences conducted a survey of proposed haulage roads for Warragamba Dam, Wallacia and Luddenham. Eight sites were recorded: five shelters containing PAD along Megarrity's Creek, a small artefact scatter on the comer of Park Road and Montellmar Place; an Isolated stone axe and a small post contact quarry on the north side of Farnsworth Avenue. Further testing of PAD sites was recommended under a DEC Section 87 Preliminary Research Permit.
Brayshaw 1999: Warragamba Dam Spillway. Archaeological Survey for Aboriginal Sites.	Brayshaw conducted an additional survey for a spoil emplacement associated with the Warragamba Dam spillway. No sites or PADs were identified and no further investigations were recommended.
AHMS 2005: Warragamba STP Effluent Discharge Pipeline, Aboriginal Heritage Impact Assessment	AHMS were commissioned by Priority Sewerage Program Alliance Team (PSPAT) at Sydney Water to prepare an Aboriginal archaeological assessment of a proposed effluent pipeline route at Warragamba Dam. One Isolated Artefact (WP1) and three Open Artefact Scatters (WP2, WP3 & WP4) were located in Warragamba Park. Areas of High and Moderate potential to contain intact Aboriginal sites and/or isolated objects in subsurface deposits As the proposed pipeline route was located within the site WP3 and areas of High and Moderate archaeological potential the following recommendation were made: reconsider the previously approved pipeline route from Warragamba STP to Middle Gully. redesign the proposed route to avoid and/or minimise impact on Aboriginal sites and PADs. conduct further archaeological investigations

4.2.1 Summary of Local Archaeological Studies

The majority of the archaeological assessments that have been undertaken within close proximity to the dam were for the 1995 EIS for a proposed dam wall raising (Brayshaw and McDonald 1988 and 1989). Other small surface surveys relating to dam infrastructure on the periphery of the dam area have been undertaken by, Brayshaw (1992, 1995 and 1999) and AHMS (2005). Due to the Subject Area being a water catchment Special Area and/or National Park/State Conservation Area for the past 70 years, there has been previous limited archaeological investigations as the area is protected from development.

4.3 Previous heritage assessments and ethnographic sources of the region

4.3.1 Regional Archaeological Studies

The Subject Area falls within the Blue Mountains Plateau and the Hawkesbury and Nepean River systems, which include the Coxs River and Wollondilly River systems. This area has been of archaeological focus for some time due to the high frequency of sandstone rockshelters. McCarthy (1978), Stockton (1970), Stockton and Holland (1974), Johnson (1974) and Kohen et al. (1981) contributed over the years to the chronology of the Blue Mountain's region with numerous sandstone shelter sites investigated, including

Shaw's Creek, Springwood Creek, Kings Table, Lyre Bird Dell, Walls Cave, Blackfellows Hands shelter, Capertee 1-5, Emu Plains Shelter and Lapstone Creek.

Over the past few decades there has been a large number of archaeological investigations across the Cumberland Plain generated by the urban development of the area. Some of the earliest investigations were undertaken by McCarthy (1948) in his attempt to form a typology of Aboriginal stone tools. Later excavations of KII rockshelter by Kohen et al. (1984) aimed to characterise the colonisation of the basin. Other notable investigations include the works of Lambert (1966, 1971), Megaw (1965, 1968), Moore (1970, 1981) and Nanson et al. (1987) and Stockton and Holland (1974) in the Blue Mountains. All these investigations aimed to understand the history and behaviour of past Aboriginal use and occupation in the region. These large data sets have enabled analysis of past spatial and occupational patterns of Aboriginal groups in the region.

Key studies have been undertaken on the major river systems of the Sydney Basin; the Parramatta River, Georges River, Hawkesbury-Nepean and Hunter River/Wollombi Brook. These investigations have demonstrated the presence of Pleistocene, and often Last Glacial Maximum (LGM) occupation (AHMS, 2015; Hughes et al., 2014; McDonald, 2008). Investigation of the wider Cumberland Plain has been extensive. One of most important was by McDonald (1995) at Rouse Hill Infrastructure Project. This provided the first large-scale systematic study of lower order drainage lines, including Second Ponds Creek and Killarney Chain of Pond. This investigation demonstrated the intensification of occupation during the last few thousand years.

The oldest dates for Aboriginal occupation of the Sydney basin comes from sites such as PT 12 (Williams et al., 2014), SGCD 16 (Fal Brook Site) (Koettig, 1987) and the Parramatta Sand Sheet (McDonald, 2008) indicating Aboriginal hunter-gatherers likely visited and colonised the Sydney Basin around 36,000 years BP. These areas remained occupied and intensively used through a period of extreme aridity, the LGM (Williams et al, 2013). The understanding of the post-LGM period is poor, however archaeological deposits indicating similar behaviours to that of the LGM, even with the improving climate and resources throughout the region. The early and mid-Holocene (10-5,000 years BP) also appears highly variable in the archaeological record with the possible expansion of populations along lesser order drainage lines such as Eastern Creek and Cattai Creek (AHMS, 2014, 2015). The late Holocene (5,000-0 years BP) sees extensive increased occupation of the Cumberland Plain with the vast majority of the 12,000 or so sites recorded from this period.

This pattern known as the Eastern Regional Sequence (ERS) was identified by Attenbrow from the Mangrove Creek Catchment north of Sydney. (refer to Table 7, Attenbrow 2010). Early industries tend to be dominated by poorer quality raw material including quartz, tabular and granular cherts and river pebbles. Around 5000 years BP, an increased use of rockshelters is observed, assemblages contain a much larger proportion of fine-grained raw materials with backed implements and smaller flake debris. In the last 1500-1000 years BP, Bondi points, a type of backed artefact, and geometric microliths are less common and there is a visible shift toward the production of eloueras. Around the same time period there is marked increase in quartz flakes and quartz bipolar cores with a decline in fine grained materials like silcrete and chert (Attenbrow 2010 and McDonald 1997).

While there is early evidence that the Sydney region has been occupied for over 36,000 years (Williams et al. 2014), archaeological research indicates the earliest evidence for occupation in the eastern Blue Mountains is 12,000 years Before Present (BP) from Walls cave, Lyre Bird dell and Kings Table. The earliest date recorded at Kings Table of 22,000 years BP has been rejected due to a lack of clarity on associated taphonomic processes (Johnson 1979). Previous researchers have indicated that the occupation of these

shelters is around 12,000 years BP and was consistent with a pattern of earlier but not very intensive occupation. Occupation evidence continues to be sporadic up until about 5000-4500 BP where an increasing and continued use of shelters has been identified (Attenbrow 1981).

Table 7: Summary of key attributes in the eastern regional sequence for the Sydney region (Attenbrow 2010: 153-158)

ERS Phase		Geological Period	Attributes
Bondaian 5000 years ago to 1788 AD	Late Bondaian ca 1600 years ago to 1788AD	**Late Holocene** Period 5,000 to 1,600 years ago	Elouera increases in number. Intra-regional variation observed between the coast/sandstone country and the Cumberland Plain. Along coast and in sandstone country fewer Bondi Points and geometric microliths were used. Unmodified flakes, mainly of quartz, often produced by the bipolar technique [implements of bone and shell some probably as piercing and cutting, scraping components in tools and weapons found more often but due to non-preservation in earlier levels. In Cumberland Plain, tool kit continued as earlier (with backed artefacts until at least 600 years ago) in places where silcrete and chert/tuff were the dominant raw materials. In these places' quartz was a minor component and bipolar technique used infrequently. Change around 650 years ago with few backed artefacts being produced. Increase in ground edged hatchets from c. 1000 years ago). Archaeological evidence of processing of plant foods from (c.1150 years ago) again due to non-preservation in earlier levels. Fishing with shell hook & line from c.900 years ago.
	Middle Bondaian ca 3000 – ca 1600 years ago		
	Early Bondaian ca 5000 – ca 3000 years ago		Backed artefacts often the characteristic tool-type Implements and associated debitage made (incl. Bondi Points, geometric microliths, Elouera and other retouched flakes) are much smaller in average size and weight than those from earlier assemblages. Silcrete, chert and tuff and other fine-grained siliceous material were the preferred materials for backed artefacts. Elouera and ground implements (such as hatchets) appear c.4500-4000 years ago. C.3500-3000 years ago backed artefacts and thumbnail scrapers increasingly used and produced across the region and higher numbers of backed artefacts found in coastal locations. Increasing use of the bipolar percussive technique over free-hand percussion over time (esp. from 3000 to 1788AD).
Capertian > 5000 years ago		**Early Holocene** Period 10,000 – 5,000 years ago	Stone tools of previous period continued. Small flakes are backed forming Bondi Points which appear in limited numbers in some areas (although not yet confirmed in Sydney region, they are present in Upper Mangrove Creek at 8500 years ago and Capertee 3 at 7500 BP).
		Pleistocene: Pre-Glacial to post –Glacial 60,000 – 10,000 years ago	Tools (stone tools with retouch and some usewear). Flakes produced by free-hand percussion and some limited bipolar flaking. Retouched flakes on average are larger than Bondaian phased retouched artefacts. Principal raw material local tuff/chert but other types also observed including silcrete, quartz and basalt.

5. Landscape context

5.1 Overview

Understanding the past and present environmental contexts of an area is requisite in any Aboriginal archaeological and cultural heritage investigation (DECCW 2010a). The nature and distribution of Aboriginal archaeological sites are closely related to the environmental context. This section provides a broad overview of the environmental setting of the Subject Area, before describing each of the soil landscapes that are contained within it. Soil landscapes, when considered with the levels of past land use and modification, are a useful tool in identifying environmental proxies for the likely preservation and burial of Aboriginal objects in a landscape and resources that may have been available to Aboriginal people in the past. Examples include the presence of rock outcrops to provide surfaces for art or to sharpen and prepare implements, stone for the manufacture of stone tools and plant species.

5.2 Geology

The Subject Area and adjoining landscape falls within the deeply incised sandstone gorges of the Burragorang physiographic subregion of the Sydney Basin. The geology of the Burragorang is dominated by more recent geologies of Permian and Triassic sandstone with limited basalt caps. Within the Subject Area sandstone predominates with siltstone present in the northern, eastern, and central areas. The landscapes of the Burragorang have typically formed into tablelands with cliff features above broad, moderately steep escarpment slopes. The cliff lines generally indicate the break in geology with Triassic sandstones above and the more weatherable Permian sandstone, shale and siltstone below. Aboriginal site types associated within this geological region are likely to include sandstone shelters, rock overhangs or boulders with archaeological deposits, art, midden and/or artefacts, Axe Grinding Groove sites and, in areas with mature trees, Scarred Trees. In the western and south-western Subject Area, geologically older rocks form the main strata. Devonian, Ordovician and Silurian aged substrates form similar shallow infertile soils where underlying rock is often exposed. Quartzites, siltstones, clay stones and shales are dominant. These older sediments have generally formed within more incised, narrower valleys without dominant cliff lines. The Coxs Valleys provide examples of these metasediments. Aboriginal site types associated within this geological region would consist of Open Camp Sites and Isolated Artefacts.

There are seventeen soil landscapes present within the Subject Area which are defined by Bannerman *et al.* (2010), DPIE (2008), Hazelton and Tille (1990) and King (1994) as the Barralier, Cedar Valley, Coxs River, Emu Island, Faulconbridge, Gymea, Hassans Walls, Hawkesbury, Horse Flat, Jooriland Range, Kanangra Gorge, Kedumba, Martins Flat, Martins Flat variant A, Round Mount, Warragamba and Wollondilly River. These formations are divided into alluvial, colluvial erosional, residual and transferral landscapes and are further described in Sections 5.3 to 5.7 and Figure 6.

5.3 Erosional Soil Landscapes

Erosional soil landscapes are characterised by areas where soil and rock are being removed at a rate greater than they can be transported and deposited from other locations. Mechanisms for erosion commonly occurring within the Subject Area include wind and water; both through rain and stream wash (Bannerman *et al.* 2010, DPIE 2008, Hazelton and Tille 1990 and King 1994). Site types would likely include Isolated Artefacts, Open Camp Sites and where suitable geology occurs, Axe Grinding Groove sites and Rockshelters. There are six erosional soil landscapes within the Subject Area; Cedar Valley, Gymea, Jooriland Range, Kedumba, Martins Flat and Martins Flat variant A which are outlined in Table 8.

Table 8: Erosional soil landscapes within the Subject Area

Soil landscape	Characteristics	Potential archaeological sites
Cedar Valley	The Cedar Valley soil landscape is characterised by narrow convex crests and ridges with moderately to steeply inclined side slopes away from sandstone escarpments. Narrow, deeply incised valleys are characteristic of this soil landscape. Slope gradients are 15 –60% with a local relief of 50 –150m. Soils vary from yellow brown loamy sands to medium clays.	This soil landscape is archaeologically sensitive. The moderately inclined slopes from 15-30% are where Aboriginal sites may be located. Slopes up to 15% with loamy sands have the potential for Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees.
Gymea	The Gymea soil landscape is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone, with broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps (Hazelton and Tille 1990). Local relief ranges between 20 – 80 m, with slopes between 10-25%. Soils are noted as including Yellow Earths, Earthy Sands, Siliceous Sands, Gleyed Podzolic Soils, Yellow Podzolic Soils and Leached Sands (Hazelton and Tille 1990).	This soil landscape is archaeologically sensitive. The moderately inclined slopes from 10-25% are where Aboriginal sites maybe located. Slopes from 10-15% within sands have the potential for Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees.
Jooriland Range	The Jooriland Range soil landscape is characterised by low hills and hills on Bindook Porphyry (quartz porphyry). Slope gradients are 2 - 33% with a local relief of 10-90 m.	This soil landscape is archaeologically sensitive. The very gently inclined to moderately inclined slopes from 2-30% are where Aboriginal sites maybe located. Slopes from 2-15% have the potential for Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees.
Kedumba	The Kedumba soil landscape is characterised by broad ridges and valley flats comprised of undulating to rolling rises. Slopes are waning with slope gradients ranging from 5 – 15%. with a local relief up to 30 m. Soils are generally dark brown loamy sands, bleached sands and blocky clays.	This soil landscape is highly archaeologically sensitive. Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees are likely.
Martin Flat	The Martin Flat is characterised by hills on Permian Shoalhaven Group (siltstone/mudstone). Slope gradients are 5-30% with a local relief of 20-150m.	This soil landscape is archaeologically sensitive. Slopes from 5-15% have the potential for Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees.
Martin Flat Variant A	The Martin Flat Variant A is characterised by hillslopes and foot slopes within low hills on Permian Shoalhaven Group. Slope gradients are 5-25% with a local relief of 20-90m.	This soil landscape is archaeologically sensitive. The moderately inclined slopes from 5-25% are where Aboriginal sites may be present. Slopes from 5-15% have the potential for Open Camp Sites, Isolated Artefacts, PADs and Scarred Trees.

Plate 1: Example of the Kedumba Erosional soil landscape

Plate 2: Example of the Cedar Valley Erosional soil landscape

5.4 Alluvial Soil landscapes

Alluvial soil landscapes are formed by deposition along rivers and streams. Alluvial soil landscapes include floodplains and alluvial deposits. Typical landform elements include these found in meandering plains, including bars, back plain, scroll plains, flood-outs, ox-bows, levees, terraces and prior and current stream channels (Hazelton and Tille 1990). Site types would likely include Isolated Artefacts, Open Camp Sites and Potential Archaeological Deposits. There are three alluvial soil landscapes within the Subject Area; Coxs River, Emu Island and Wollondilly River which are outlined in Table 9.

Table 9: Alluvial soil landscapes within the Subject Area

Soil landscape	Characteristics	Potential archaeological sites
Coxs River	The Coxs River soil landscape is characterised by swamps within alluvial plains and terraces on Quaternary Alluvium (alluvium). Local relief ranges from 2-20 m with slopes from 0-5% and nil rock outcropping. Soils include brown earths and alluvial soils.	This soil landscape is archaeologically sensitive with the possibility for deep alluvium, providing the accumulation of archaeological deposits. The soil landscape has gentle slopes and is associated with water ways. These factors make the presence of Open Camp Sites, Isolated Artefacts and Potential Archaeological Deposits (PAD) highly likely
Emu Island	The Emu Island soil landscape is characterised by alluvial plains on Quaternary Alluvium (alluvium and silt). Local relief ranges from 0-5 m with slopes from 0-2% and nil rock outcropping.	This soil landscape is archaeologically sensitive with the possibility for deep alluvium, providing the accumulation of archaeological deposits. The soil landscape has gentle slopes and is associated with water ways. These factors make the presence of Open Camp Sites, Isolated Artefacts and Potential Archaeological Deposits (PAD) highly likely
Wollondilly River	Wollondilly River soil landscape is characterised by alluvial plains and terraces on Quaternary Alluvium (alluvium). Local relief ranges from 0-15 m with slopes from 1-6% and nil rock outcropping. Soils include yellow/brown alluvial deposits	This soil landscape is archaeologically sensitive with the possibility for deep alluvium, providing the accumulation of archaeological deposits. The soil landscape has gentle slopes and is associated with water ways. These factors make the presence of Open Camp Sites, Isolated Artefacts and Potential Archaeological Deposits (PAD) highly likely

Plate 3: Example of the Emu Island Alluvial soil landscape

Plate 4: Example of the Emu Island Alluvial soil landscape

5.5 Colluvial Soil Landscapes

In colluvial landscapes the dominant form of landscape formation is mass movement (rock fall) with steep slopes, rock outcrops and shallow stony highly permeable soils (Hazelton and Tille 1990:45, 58). Site types would likely include Isolated Artefacts, Open Camp Sites and where suitable geology occurs, Axe Grinding Groove sites and Rockshelters. There are six colluvial soil landscapes within the Subject Area; Barralier, Hassan wall, Hawkesbury, Kanangra Gorge, Round Mount and Warragamba. The soil landscapes are outlined in Table 10.

Table 10: Colluvial soil landscapes within the Subject Area

Soil landscape	Characteristics	Potential archaeological sites
Barralier	The Barralier soil landscape is characterised by cliffs and scree within mountains on Bindook Porphyry (quartz porphyry). Local relief ranges from 200-500 m with slopes from 25-50% and abundant rock outcropping.	This soil landscape generally has slopes that are too steep for rock overhangs suitable for Aboriginal sites. However, on more moderately inclined slopes from 25%-30%, Aboriginal sites may occur
Hassan Wall	The Hassan Wall soil landscape is characterised by precipitous sandstone cliffs, formed above steep to very steep colluvial side slopes. Local relief is 100 – 500 m with slopes generally greater than 40% becoming gentler on lower slopes and narrow drainage flats. Soils include loamy sands, sands and pedal clays.	This soil landscape generally has slopes that are too steep for rock overhangs suitable for Aboriginal occupation. The gentler lower slopes, narrow drainage flats and soils consistent with Hassan Wall would be suitable for Open Camp Sites, Isolated Artefacts and Axe Grinding Grooves
Hawkesbury	The Hawkesbury soil landscape is characterised by rugged, rolling to very steep hills on Hawkesbury Sandstone, with narrow crests and ridges, narrow incised valleys, steep side slopes with narrow rocky benches, broken scarps and boulders. Local relief ranges between 100m - 200 m, with slopes generally greater than 25%. Soils include Lithosols/Siliceous Sands, Earthy Sands, Yellow Earths, Yellow and Red Podzolic Soils and Siliceous Sands.	This soil landscape is archaeologically sensitive within the Subject Area as the blocks and weathered scarps provide suitable overhangs to be used for shelter. Within these overhangs there is often suitable surfaces for art, as well as floor space for the accumulation of archaeological deposit
Kanangra Gorge	Kanangra Gorge soil landscape is characterised by steep to very steep hills and mountains. Small narrow, convex crests occur above steep to very steep (occasionally precipitous), deeply incised valleys. Occasional areas of rock land occur on some slopes with small cliffs evident on some upper slopes. Slopes are generally greater than 30% with a local relief greater than 300 m. Soils include brown clay loam and reddish-brown clays.	This soil landscape generally has slopes that are too steep for rock overhangs suitable for Aboriginal sites. However, on more moderately inclined slopes Aboriginal sites may be located.

Soil landscape	Characteristics	Potential archaeological sites
Round Mount	Round Mount soil landscape is characterised by steep to very steep hills and mountains with narrow and convex crests. Small rocky cliffs are present on some slopes. Slope gradients are generally greater than 35% with a local relief less than 400 m. Soils include brownish black loamy sands to bright brown clays	This soil landscape generally has slopes that are too steep for rock overhangs suitable for Aboriginal sites. The soils within this landscape would not be suitable for Open Camp Sites or Isolated Artefacts.
Warragamba	The Warragamba soil landscape is characterised by moderate to very steep slopes, sloping narrow ridges with narrow sandstone and colluvial benches occurring on the slopes which contain sandstone boulders. Local relief ranges from 80–130 m with slopes generally greater than 25%. Soils include dark brown loamy sand, dark reddish-brown clayey sand and pedal clay.	This soil landscape generally has slopes that are too steep for rock overhangs suitable for Aboriginal sites. However, on more moderately inclined slopes from 25-30% Aboriginal sites may be located.

Plate 5: Example of the Warragamba Colluvial soil landscape.

Plate 6: Example of the Warragamba Colluvial soil landscape.

5.6 Transferral Soil Landscapes

Transferral soil landscapes are deep deposits of mostly eroded parent materials washed from areas up slope. Stream channels are often discontinuous, and slopes are generally concave. Transferrable landscapes include foot slopes, valley flats, fans, and piedmonts. Horse Flat is the only residual soil landscape located within the Subject Area (refer to Table 11).

Table 11: Transferral soil landscapes within the Subject Area

Soil landscape	Characteristics	Potential archaeological sites
Horse Flat	The Horse Flat soil landscape is characterised by Fans on Quaternary Alluvium (alluvium, colluvium and unconsolidated). Slope gradients are 2-25% with a local relief of 20-60 m.	This soil landscape is archaeologically sensitive with the possibility for deep alluvium. All slopes within this soil landscape have the potential for Aboriginal sites. Moderately inclined slopes, 2-15%, have a high potential for Open Camp Sites, Isolated Artefacts, Potential Archaeological Deposits (PAD) and Scarred Trees.

5.7 Residual Soil Landscapes

Residual soil landscapes are characterised by areas where soils are derived from the long term, in-situ weathering of parent materials. Examples of these types of soil landscapes are flats, plains, and plateaus with poorly defined drainage lines (Hazelton and Tille 1990). Faulconbridge is the only residual soil landscape located within the Subject Area which is outlined in Table 12.

Table 12: Residual soil landscapes within the Subject Area

Soil landscape	Characteristics	Potential archaeological sites
Faulconbridge	The Faulconbridge soil landscape is characterised by hillcrests within plateaus on Hawkesbury Sandstone (sandstone-quartz and siltstone/mudstone). Slope gradients are 0-5% with a local relief of 0-20 m.	This soil landscape is highly archaeologically sensitive. Open Camp Sites, Isolated Artefacts, PADs, and Scarred Trees are likely

5.8 Disturbance and Modification

Apart from soils located below the full supply level (FSL) of Warragamba Dam, most soil landscapes have been subject to limited impacts over time as the Subject Area has been protected as either a National Park/State Conservation Area or a water catchment Special Area. Consequently, there has been little development or impacts on soils.

The land use impacts in the Subject Area include:

- Creation of Warragamba Dam and flooding of Lake Burragorang
- Installation of services (for example power lines and pipes)
- Historical underground coal mining
- Installation and maintaining fire trial and roads

Each of the above land uses and activities impacts the preservation and visibility of the archaeological record within the Subject Area. However, the majority of the Subject Area has been subject to very limited modification and disturbance.

5.9 Summary

The Subject Area consists of rugged sandstone ridgelines and escarpments, with flats to very steep slopes and narrow incised valleys and creeks surrounding Lake Burragorang. The areas below the FSL of Warragamba Dam has been heavily impacted, however the majority of the Subject Area has been exposed to limited disturbance or modification having been protected as either a National Park/State Conservation Area and a water catchment Special Area. This landscape is most likely to contain Open Camp Sites and Isolated Artefacts around the Lake's shore and Rockshelters that were used for occupation shelter and for art. Sandstone platforms located within the rivers, tributaries and adjacent to swamps are most likely to contain Axe Grinding Grooves.

5.9.1 Historical Land Use and Disturbance

From the early to mid-19th century, the alluvial lands surrounding the Blue Mountains were gradually utilised for mining and agriculture. The mining township of Burragorang was established within the Subject Area from 1827, developing into a small mining centre of houses, farms, churches and several guesthouses (Artefact 2018: 44). These historical land uses below the FSL ceased with the construction of Warragamba Dam from 1948 and the formation of Lake Burragorang and evidence of both European and Pre-European land use below the FSL was substantially impacted by inundation from that time.

Terrain within the Subject Area that lies above the FSL of Warragamba Dam is generally precipitous and remained largely unimpacted during the early historical period.

5.9.2 Modern Land Use and Disturbance

Commencing with the construction of Warragamba Dam, each of the below land uses and activities has impacted the preservation and visibility of the archaeological record within the Subject Area. However, the

majority of the Subject Area has been subject to very limited modification and disturbance. Modern land use impacts in the Subject Area include:

- Construction of Warragamba Dam and flooding of Lake Burragorang
- Installation of services (for example power lines and pipes)
- Historical underground coal mining
- Installation and maintenance of fire trial and roads

During the modern era terrain within the Subject Area that lies above the FSL of Warragamba Dam remained protected within either a National Park/State Conservation Area or a water catchment Special Area. Consequently, these areas have been subject to little development or impacts.

6. Regional character

6.1 Past Aboriginal land use in the Subject Area

The reconstruction of past land use of Aboriginal people in the Subject Area and surrounding region Cumberland Plains and the structure of their society is an extremely difficult task and, apart from the archaeological record, relies on documents written by non-Aboriginal people, including early surveyors, military officers and settlers. The inherent bias of the viewpoint, class and cultures of those people inevitably affected their observation and conclusions about the Aboriginal way of life. Historical accounts also make comment on a culture already disrupted by European settlement and the effects of colonisation.

Within the region of the Subject Area, the extensive and continued occupation of the Sydney Basin has left a vast amount of accumulated archaeological material. The oldest reliable date for the earliest occupation around the region comes from excavations across a source bordering dune overlooking the Hawkesbury River and indicates occupation of the region by at least 36,000 years ago (Williams et al, 2014). The earliest occupation in the Lower Blue Mountains dates back well into the Pleistocene period to 12,000 Before Present (BP) (Bowdler 1981 and Johnson 1976).

The Subject Area for the Archaeological Report spans the traditional country of the Tharawal, Darug and Gundungurra Aboriginal peoples. Tindale (1940, 1974) observed that the Gundungurra occupied the Nattai and Burragorang Valley and the Ranges as far west as Bathurst. The Darug occupied the Cumberland Plain between Appin in the south, the Hawkesbury River in the north, west of the Georges River and Parramatta. The Tharawal ranged from the south side of Botany Bay, the Georges River to the Liverpool and Campbelltown Area (Attenbrow 2010, 34; SA Museum 2010). Attenbrow (2010, 35) pointed out that such boundary mapping is only indicative at best because it was undertaken in the nineteenth century. Gundungurra, Tharawal and Darug peoples would have regularly communicated, moved, traded and participated in ceremonies between their country and neighbouring areas. It is likely that family groups or clans would 'intermingle and interact along both physical and social boundaries' rather than be strictly confined to the 'tribal' borders that were artificially imposed by European anthropologists (Organ 1990: xliii).

The name Warragamba comes from the Aboriginal words Warra and Gamba meaning water running over rocks. William Russell or 'Werriberrie', a Gundungurra man born in 1830 near the banks of the Monkey Creek, provided an important insight into the social life of Aboriginal people living in the Warragamba region. He mentioned Bents Basin to the south of Warragamba, this area is known as 'Gul-guer' meaning falling or shooting down or swirling around causing the water to form a hole or whirlpool (Williams R., 1914). This was considered the lurking place of the Gurangatch, a 'Rainbow serpent', believed to live in the waterholes (Smith, 2008). Two of Russell's family members drowned at this location.

R.H. Matthews in 1905 collected a large body of information about the language, ceremony, mythology and social organisation of the Gundungurra, Tharawal and Darug people. Gatherings of small and large numbers of people are likely to have taken place for ceremonial reason and/or to share seasonally abundant resources. Occasions for large gatherings may have included predictable seasonal events such as bird migrations. Such interaction between groups are likely to have varied with the seasons and the availability of resources, technology and knowledge. This is reflected in the relatively homogenous cultural features observed in the Sydney region (McDonald 1992).

Aboriginal hinterland groups were largely dependent on freshwater and terrestrial animals and plants. The inhabitants of the hinterland areas were hunters, gathers and fishermen. Animals such as wallabies,

kangaroos, possums, flying foxes as well as parrots, water birds, reptiles, freshwater fish and yabbies would have made up part of the diet of the inland dwelling hinterland groups. Due to the abundance of permanent water sources in the area, there would have been plentiful resources to sustain multiple campsites.

The arrival of the First Fleet at Sydney Cove in 1788 was followed the next year by a smallpox epidemic, which spread to the neighbouring regions and, although the exact effects are not known, it killed over half the Aboriginal population of the areas affected (Organ 1990: 5).

Early in the nineteenth century European graziers began taking land in the south of the Cumberland Plain and the coastal plains around Wollongong, with cedar clearing being conducted in the narrower northern coastal plain and rainforest areas of the escarpment (DEC 2005). Access to traditional and everyday resources (such as water) and clearing the land of trees would have had a major impact on the ways in which Aboriginal people were living. This also caused significant social disruption between Aboriginal groups and pressure between Aboriginal people and the growing European population. Drought began and the competition for resources between the Europeans and the Aboriginal people who were adapting to the massive changes that were so quickly upon them, led to several years of conflict. Organ (1990) documents the various skirmishes, killings and reprisals between Europeans and the Aborigines during the 1814 – 1815 period in the Cowpastures, Camden and Appin districts. Eventually this sporadic bloodshed would lead to larger scale conflict, with Governor Macquarie implementing a sustained punitive action against the Aboriginal population in the district.

This resulted in the Appin Massacre of 17 April 1816, in which Aboriginal people were shot and driven over the steep cliffs, somewhere near Broughtons Pass, during a surprise night attack by a detachment of the 46th Regiment. By 1877 only 60 Gundungurra people were known to have survived the contact period and were relocated to the St Joseph's settlement, founded by Rev. Dillon of Camden. The settlement was located at the junction of the Cox's River and the Warragamba Gorge in the Burragorang Valley. Despite the massive changes that were so quickly brought to the Aboriginal people of the region, they maintained a sense of community, traditional customs and practices, cultural knowledge and continued to care for significant sites and the land in general. Today there are many thousands of Aboriginal people living in the Cumberland Plain and the Blue Mountains. They continue to be custodians of the land, whilst traditional owners maintain cultural knowledge (DEC 2005).

The contribution Aboriginal people have made to the pastoral and agricultural industry of NSW – both directly and indirectly – has begun to receive increasing recognition over the last 20 years (Harrison 2004). Aboriginal people in the Burragorang Valley were regularly employed on farms in the region, and were encouraged to work their own land at St Joseph's Farm. The establishment of farming enterprises in the Burragorang Valley benefitted greatly from the contributions of the traditional owners of the land, and the local shared history from these early days of the pastoral industry is an important piece of history. Throughout NSW, Aboriginal people were a ready and exploitable labour force. Further details in regards to the past agricultural use of the valley is detailed in the CVAR.

For most Aboriginal people this provided an opportunity to remain on their traditional country in the early phases, before the land was fully enclosed and access to it further controlled, and before the Aborigines Protection Board began to forcibly move and relocate people in the twentieth century. Most people worked not for wages or salary, but simply for rations.

Once the Warragamba Dam was under construction, local Aboriginal people formed a larger part of the labour force, and were especially involved in the felling of all trees below the high water mark (Smith, 2016).

In the period following the dam construction to the present day the Aboriginal people of the region continue to use the valley for cultural practises where possible. This includes but is not limited to spending time camping as well as leading and participating in walks through country to interact with cultural heritage sites and the surrounding landscapes. Aboriginal community member as outlined in Section 3 of the ACHA Report and this document have also been involved in the survey and recording of Aboriginal cultural heritage sites as part of this projects assessment process.

6.2 Synthesis of regional character and Aboriginal land use

This section summarises the landscape and archaeological context of the Subject Area and broader region to provide predictive statements about the likelihood and nature of archaeological evidence in the Subject Area.

The Subject Area is located within the Burragorang physiographic subregion of the Sydney Basin a landform system characterised by characterised by tablelands escarpments and deeply incised gorges and river valleys. The material traces of past land use within the Burragorang and Blue Mountains landscapes reflect the importance of geology, topography, hydrology associated resources in determining occupational patterns (Johnson 1979; Bowdler 1981; Conyers 1985; McIntyre 1990). Past studies of the broader Burragorang physiographic region have highlighted the distribution of site types within these landscapes.

While there is early evidence that the Sydney region has been occupied for over 36,000 years (Williams et al. 2014), archaeological research indicates the earliest evidence for occupation in the eastern Blue Mountains is 12,000 years Before Present (BP) from Walls cave, Lyre Bird dell and Kings Table. Previous researchers have indicated that the occupation of these shelters is around 12,000 years BP and was consistent with a pattern of earlier but not very intensive occupation. Occupation evidence continues to be sporadic up until about 5000-4500 BP where an increasing and continued use of shelters has been identified (Attenbrow 1981).

The archaeological evidence highlights the utilitarian use and occupation of the ridgelines and sandstone shelter formations within the Burragorang Valley. This occupation is highlighted by the number of Shelters with Art, Deposit, Axe Grinding Grooves as well as Open Camp Sites containing stone artefacts and Scarred Trees that are by products of the manufacture of items which were not preserved- such as containers and canoes, or were discarded in the location used or elsewhere, such as stone tools for hunting, cutting, cleaning and processing foods (as outlined in Section 2) and making of other or wooden implements. The stories highlighted in the CVAR and archaeological evidence suggest that the Aboriginal people of the valley conducted utilitarian activities such as axe sharpening and grinding and camping but also practised ceremonial and other socially important aspects of life such as artistic expression; as outlined in the number of shelters in where the remains of this expression is still present, which may have also been used for ceremonial or other social and cultural purposes, such as education and for the passing down of the story Gurrangatch- Mirrigan Dreaming Track, further highlighted in the CVAR.

Reviewing the distribution of sites within the landscape per slope class assists in providing a greater understanding and predicting of where Aboriginal sites might be likely within the Subject Area. Slope classes of importance to the Subject Area are 0-30% gradients as these will be the slopes mostly likely to provide suitable areas for Aboriginal occupation. 0-18% are slope classes considered likely for Open Camp

Sites, Isolated Artefacts and Scarred Trees. Whereas all slopes from 0-30% are the most likely to provide suitable shelters for occupation.

From the data represented on the AHIMS, Open Camp Sites and modified trees are the mostly likely site type to occur on moderately inclined slopes from 0-15%. Twenty four out of the 42 Open Camp Sites and six out of twelve Scarred Trees are situated in this slope class. Grinding grooves, Aboriginal resource and gathering and art sites have too small a data set to be conclusive of which slope classes these are likely to occur in. All site types occur mostly on slope class 0-15%. This data set could account for bias in areas surveyed compared to areas not surveyed. This bias could account for the lack of data within slope classes 15-25%, slope class 25-35% and slope class >35%.

Biosis Research (2007) and Niche (2018) conducted extensive surveys of the Metropolitan Special Area for the Dendrobium Area 3 and Dendrobium Areas 5 and 6, a similar landscape to Warragamba Special Area. This study was located within the Avon and Cordeaux Dam catchment areas approximately 67 km south east of the Subject Area. Aboriginal sites within Metropolitan Special Area are mostly located within the moderate to steep slope classes. Niche (2018) lists 33 of the 41 sites located within the AHIMS search area of this project being located on moderate to steep slope classes. In this case moderately inclined slopes are defined as slopes of between 5.75 and 18 degrees, steep is defined as between 18 and 30 degrees. This study suggests that in the Subject Area that high numbers of Aboriginal sites may be present on moderate to steep slope classes, although not many Aboriginal sites have been recorded to date due to the lack of extensive survey. Dendrobium Area 3 and Dendrobium Areas 5 and 6 have been extensively surveyed and do not have a bias in areas surveyed compared to areas not surveyed. This is shown in the histogram below that clearly indicates that Aboriginal sites are found in high frequency on moderate – steep slope classes. Slope analysis and distribution of sites per slope gradient for Dendrobium Area 3 and Dendrobium Areas 5 and 6 are outlined in Chart 1.

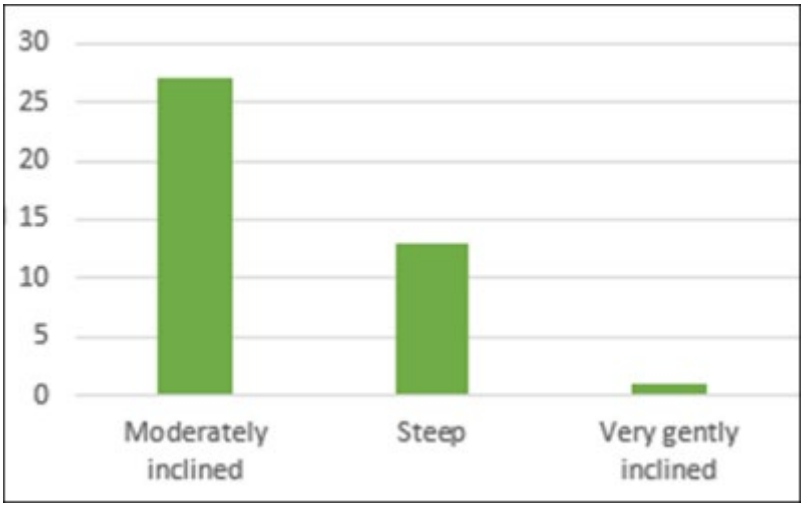


Chart 1. Distribution of sites in Dendrobium Area 5 and 6 (Niche 2018)

Aboriginal cultural heritage sites within the Subject Area will be located on slopes from 0-30% with higher densities of Aboriginal sites located on slopes from 0-18%. The data from Chart 1 clearly shows that AHIMS sites within the Subject Area cluster on slopes from 0-18% but are represented on slopes up to 30% with none located on slopes over 35%. From Chart 1 it can be concluded that that Aboriginal sites within the Metropolitan Special Area cluster on slopes from 6-18% but are represented mostly on slopes from 6-30%. The expectation from the Project was that Open Camp Sites, Isolated Artefacts and Scarred Trees are mostly likely located on slope classes from 0-18%. Sandstone overhangs with archaeological deposits, art, midden and/or artefacts can be expected to be located on slope classes from 18-30%.

With respect to the Cumberland Plain, past Aboriginal Cultural heritage sites in quaternary fill sequences within creek and river valley context, specifically on floodplains, terraces, dunes, levees and lower slopes are strongly represented throughout the Cumberland plain region (McLaren et al 2019).

A number of predictive models concerning Aboriginal occupation and settlement of the Cumberland Plain have been formulated and refined based on archaeological assessments undertaken in the region (e.g. Smith 1989, AMBS 1997, White and McDonald 2010). Based on current understandings, the most common Aboriginal site types found on the Cumberland Plain are open camp sites (i.e. open artefact scatters), scarred trees and isolated Artefacts. This pattern is reflected in the AHIMS data relating to the Subject Area (Table 4). The following predictions for the nature and distribution of Aboriginal sites have been established for the wider Cumberland Plain region:

- Aboriginal sites can be expected to be identified over the Cumberland Plain (i.e. across all topographic units) with the possible exception being areas prone to flooding such as the banks of creeks and rivers.
- The density of Aboriginal sites is expected to be higher (Smith (1989) suggests by around 10%) in the northern areas of the plain due to the concentration of raw material sources in the north.
- Aboriginal sites will occur more frequently in proximity (i.e. within 200 m) of creek lines and other water sources.
- The density of Aboriginal sites will be higher in open forest contexts compared to woodland communities. Sedgeland communities will be associated with relatively high site densities.
- Larger numbers of Aboriginal sites will be identified in areas characterised by good surface visibility.
- Integrity of archaeological sites located within the Subject Area will relate directly to past land use practices and the level of disturbance resulting from such activities.

The Subject Area is likely to contain a mixture of patterns reflective of the Burragorang physiographical region and the Cumberland Plain. The next chapter looks in more detail at the predictive model developed for the Subject Area including predictions of the likelihood for specific Aboriginal features to be present.

7. Predictive Model

The predictive model developed for the Subject Area included the consideration of previous archaeological surveys and assessments in the local area and wider surrounds, the distribution and patterning of known sites within the Subject Area and surrounds, the landform units and landscape context of the Subject Area and the previous known land uses in the area.

Colluvial soils landscapes cover the majority of the Subject Area with areas on gently inclined foot slopes, simple slopes, ridges and crests which are all suitable areas for Aboriginal occupation. Erosional soil landscapes cover a large percentage of the Subject Area with gently inclined to steep slope with rockshelters suitable for Aboriginal occupation and transient use across the landscape. Alluvial soil landscapes cover a small part of the Subject Area. Alluvial plains, floodplains and terraces in close proximity to water would have been suitable areas for Aboriginal occupation. Alluvial deposits have a high significance within Subject Area, as they have the potential for deep stratified deposits preserving in situ evidence of occupation including repeated occupation over many thousands of years.

A summary of the known Aboriginal heritage site types listed in the AHIMS database is provided in Section 4.1.1. The predictive model developed for the Subject Area is as follows:

- Open Camp Sites and Isolated Artefacts form the most common class of site type or feature within the Subject Area, accounting for 80% of the AHIMS registered sites:
  - The identification of this type of site depends on ground surface visibility, as site extent and artefact numbers are only visible on the surface. This is due to the vegetation cover of the Subject Area as this type of site type may be difficult to relocate. Areas of open ground surface will be assessed for such site types.
  - The majority of these types of site occur on level to gently inclined alluvial plains, floodplains, terraces, foot slopes, simple slopes, ridges and crests.
  - The majority of sites will occur within 200 m of temporary or permanent water sources
  - The majority of sites will occur on alluvial and transferral soil landscapes, which are present within the Subject Area.
- Scarred Trees are the second most likely represented class of site type in the Subject Area, accounting for 11% of the AHIMS registered sites:
  - Scarred Trees are a site type that is formed from the removal of bark from a tree for use in the manufacture of canoes, shields, shelters and containers for sorting or carrying items.
  - The majority of the Subject Area has been protected from large scale timber felling operations due to its use as a water catchment area, significantly increasing the likelihood of survival of this site type.
- Axe Grinding Groove sites are one of the most common site types within the Subject Area, making up approximately 5% of the AHIMS registered sites:
  - Axe Grinding Groove sites will most likely occur on sandstone outcrops associated with drainage lines, swamps, creek lines and riverbeds.
  - The bulk of Axe Grinding Groove sites will contain fewer than 50 grinding grooves.
  - Grooves will generally be between 25 cm and 50 cm in length, 5 cm to 8 cm in width and between 2 cm and 5 cm in depth and represent the sharpening or preparing of ground edge hatchets or fire hardened points.
- Although not previously recorded in high numbers, sandstone shelters, boulder or rock overhangs with archaeological deposits, art, midden and/or artefacts will be one of the most common sites identified

within the Subject Area. The geological characteristics of the Subject Area are consistent with those required for sandstone shelters.

- There is a potential for Waterholes to be present within the Subject Area. This site type was not only a critical resource within the environment but played a significant role in ceremonies and as a place for the community to meet and pass down stories from one generation to another.
- Rock Engravings may be present within the Subject Area due to the presence of sandstone in close proximity to water. Rock Engravings may consist of carefully incised images of people, animals, or symbols, in the sandstone
- Burials, an uncommon site type, are present within soft aeolian and alluvial sediments, caves, or hollow trees in NSW. Such sites are more commonly located within the sand dunes of the coastal region; however, it is not completely unlikely that this site type will occur within the Subject Area.
- Stone arrangements are rare in the local area. This type of site can include mounds of rocks for burial, or markers, mythological sites, or areas of spiritual connection. There are no stone arrangements previously identified within the Subject Area.
- Ceremonial grounds, these are sites where initiation ceremonies, marriage alliance ceremonies, tribal meetings, and other important social functions were held. They are places of great significance to Aboriginal people. There are no Ceremonial grounds previously identified in AHIMS within the Subject Area.
- Aboriginal places are places of cultural significance to Aboriginal people. No Aboriginal places have been declared within the Subject Area (February 2019) or listed on AHIMS: (http://www.environment.nsw.gov.au/conservation/AboriginalPlacesNSW.htm). However, an Aboriginal Place nomination has been made for the Subject Area and is further discussed in Section 4.4.

As noted in Section 6.2, the following predictions were made regarding the distribution of Aboriginal cultural heritage sites in relation to slope gradient. Aboriginal cultural heritage sites within the Subject Area will be located on slopes from 0-30% with higher densities of Aboriginal sites located on slopes from 0-18%. The data from Chart 1 clearly shows that AHIMS sites within the Subject Area cluster on slopes from 0-18% but are represented on slopes up to 30% with none located on slopes over 35%. From Chart 1 it can be concluded that that Aboriginal sites within the Metropolitan Special Area cluster on slopes from 6-18% but are represented mostly on slopes from 6-30%. The expectation from the Project was that Open Camp Sites, Isolated Artefacts and Scarred Trees are mostly likely located on slope classes from 0-18%. Sandstone overhangs with archaeological deposits, art, midden and/or artefacts can be expected to be located on slope classes from 18-30%.

8. Assessment and Field Methods

8.1.1 Archaeological Survey

The following methods were used to identify heritage values and significant cultural themes for the Subject Area:

- Aboriginal community input – this was sought via the consultation process and correspondence and is documented in the ACHA Report and Appendix 3 and Appendix 11 of the ACHA.
- Desktop research and literature review.

A methodology for the Project's ACHA was developed by Niche. A copy of the methodology is available in Appendix 4 of the ACHA Report. The methodology follows the:

- Aboriginal Cultural Heritage Consultation requirements for proponents (DECCW 2010a);
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b); and
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011).

As part of the development of the methodology, a sampling strategy for an archaeological survey of the Subject Area was developed.

8.2 Sampling Strategy

The field surveys for the assessment concentrated on the areas of the surface that will be disturbed by the proposed dam wall raising. Previously registered sites of high archaeological sensitivity that fall within the Subject Area were also inspected (where possible) and recordings updated from their original site cards. Further to this, sampling of rivers, creek lines and large sandstone rock platforms and boulders that fall within the Subject Area were all subject to systematic survey. To assist with targeting areas that potentially would have ridgelines suitable for sandstone shelters a slope gradient analysis was undertaken in Section 8.2 and informed the predictive model. Further to this an analysis of soil landscapes and their archaeological potential was undertaken. Safety and accessibility due to dam water levels also impacted sampling strategy. A full coverage survey was not undertaken due to the outcomes of the slope and soil analysis as well as the desire of the RAPs to focus on areas highlighted by the creation story.

8.3 Survey methods

In accordance with the survey methodology for the assessment, the survey coverage varied in both focus and intensity across the Subject Area in relation to the nature of potential impacts. As described in the survey methodology, the survey of Lake Burragorang focused on those areas which would receive the most impact by the Project and were predicted to be the most archaeologically sensitive, such as creek lines, flats and slopes from 0-30%.

The survey team walked a series of transects through the terrain units. All survey transects were conducted on foot. The number of participants in a transect ranged between 3 and 5 individuals. Survey participants were generally spaced between 10 m and 20 m apart. These transects were labelled survey units and were recorded on survey recording forms and photographs taken. Environmental variables such as overall landform, slope, and distance from water, visibility, soils and the presence of sandstone outcrops were recorded for each of the survey units.

Sites were recorded using pre-prepared forms and handheld GPS with an average accuracy of ± 7 m. Data was then recorded in an excel spreadsheet system to form an Aboriginal site database (Annex 1). At sites

where more than 20 artefacts were present a sample of artefacts were recorded, and notes were made in relation to the number of visible artefacts within the Aboriginal cultural heritage site.

The results of the survey are presented in Section 9.2

9. Aboriginal Heritage Survey Results

9.1 Archaeological survey

Aboriginal cultural heritage surveys for the Project were conducted over several periods, including the following dates:

- 24 May to 6 July 2018
- 27 September to 2 October 2018
- 9 October 2018 to 10 October 2018
- 25 October 2018 to 26 October 2018
- 19 November to 27 November 2018
- 15 January to 16 January 2019
- 21 January to 25 January 2019
- 29 January to 5 February 2019
- 18 March to 22 March 2019
- 26 March to 1 April 2019
- 22 May to 24 May 2019
- 27 May to 31 May 2019
- 3 June 2019

During the survey program, the survey was conducted using a single survey team. This team comprised of two archaeologists and between one and three representatives from the RAPs (see Appendix 10 of the ACHA Report).

In summary, the survey involved 76 days of assessment. The survey conditions during all days of survey were dry and sunny. Field work was cancelled during days of predicted and actual heavy rain due to WaterNSW catchment entry conditions. A number of additional days were also cancelled due to extreme heat and fire danger. Cancelled days were rescheduled to the next available fine day, so that no survey days were lost to weather.

9.1.1 Survey coverage results

A total of 2655 ha was surveyed on foot as part of the Aboriginal heritage upstream assessment activities. Of the total hectares surveyed, approximately 464 ha (33%) of the estimated 1401 ha of the PUIA was surveyed. In addition to the area within the PUIA 2191 ha was surveyed. Survey below the FSL was made possible due to the low levels of water within the dam and the exposure of Aboriginal objects as a result of this low water level.

This survey coverage number is attributed to the assessment focusing on areas outlined by the RAPs as being connected to the creation story, ridge and creek lines that have archaeological potential as outlined in Section 9, and given the types of harm that may potentially affect the Aboriginal cultural heritage sites within the Subject Area, it is considered adequate for the purpose of this assessment. Brayshaw (1989) also noted that at least 30% of the impact zone would need to be surveyed to accurately determine the extent of Aboriginal cultural heritage sites within the Project.

The survey coverage achieved for the Subject Area presents a strong representative sample of the landscape.

Navin Officer Heritage Consultants (Navin Officer 2000: 49-50) discusses the considerations for visibility within the Illawarra Escarpment and Woronora Plateau - which can also be applied to the Warragamba catchment area. The obtrusive nature of sandstone shelter sites and rock platforms suitable for Aboriginal occupation and use is always high, even in areas as highly vegetated as catchment areas, so these sites are likely to be identified during survey efforts regardless of vegetation coverage. Further to this, the concept of archaeological visibility is also applicable to shelter sites that have artefact deposits and artefacts exposed within the shelter's dripline or on the shelter floor (Biosis Research 2009a: 48).

During this assessment the consideration of visibility as outlined by Navin Officer 2000 and Biosis Research 2009a are that the survey was divided into two types of assessment. One in the steeper more vegetated sections of the Subject Area in which sandstone shelters and scarred trees were most likely to be identified. The second type of survey comprised of looking at areas of exposure in which artefact scatters would likely to be present. Within the survey this meant areas that had previously been eroded through the Warragamba Dam's FSL; or areas that have previously been cleared for agricultural practises and fire trails.

A summary of survey coverage by slope classes and soil landscape categories within the Subject Area is provided in Table 13, Table 14, Figure 14 and Figure 15. It should be noted that as per Requirement 10 of the OEH (2010) Code of Practice for archaeological Investigation of Aboriginal Objects in New South Wales this assessment has not included tables outlining the visibility due to the obtrusive, above surface evidence of the Aboriginal occupation of the Subject Area, as per the Navin Officer (2000) assessment.

Table 13: Slope class across the PUIA

Slope Class	Slope degrees	Area (ha)	Proportion (%)
Flat or Very Gently Inclined	0-2	114	8.1%
Gently Inclined	2-6	374	26.7%
Moderate	6-18	538	38.4%
Steep	18-30	263	18.7%
Very Steep	30-45	103	7.4%
Precipitous	>45	9	0.7%
Total		**1401**	

As per the project methodology the proportional survey effort was focussed on the Moderate and Steep slope classes, with the nature of the Subject Area also resulting in a high proportional survey effort on the Gently Inclined slope class (Table 14).

Table 15 summarises the surveyed area by soil landscapes for the PUIA. Soil landscapes are often large, diverse areas of landscape and do not translate directly to slope classes. Nevertheless, the proportional emphasis on the Moderate and Steep slope classes is evident in the proportional amount surveyed of the different soil landscapes. Relatively high proportional survey has occurred on the soil landscapes that contain the predicted most sensitive archaeological landforms.

Table 14: Survey coverage across the PUIA by soil landscape

Soil Landscape	Amount of Soil Landscape (ha)	Surveyed Area of Soil Landscape (ha)	% of Soil Landscape Surveyed	Aboriginal cultural heritage sites within the soil landscape
Cedar Valley	141.01	40.35	29%	3
Coxs River	31.20	2.00	6%	0
Emu Island	9.87	5.39	55%	0
Faulconbridge	0.01	0.01	100%	0
Gymea	0.13	0.00	0%	0
Hassans Walls	274.10	89.20	33%	9
Hawkesbury	4.68	2.00	43%	0
Jooriland Range	49.73	22.90	46%	4
Kanangra Gorge	128.06	16.93	13%	7
Kedumba	172.07	72.90	42%	8
Martins Flat	205.78	55.80	27%	3
Martins Flat variant a	177.22	102.54	58%	1
Round Mount	44.45	20.12	45%	2
Warragamba	50.07	5.77	12%	3
water	35.62	3.95	11%	2
Wollondilly River	77.16	24.84	32%	1
Total (rounded)	**1401**	**465**	**33%**	**43**

9.2 Survey Results

The survey campaigns identified a total of 43 sites within the PUIA, with a total of 334 being identified during the survey; this included 303 newly recorded sites and 31 previously recorded sites. It should be noted that one previously registered site Foleys Creek is registered on AHIMS as being located within the construction area, however its registration location is incorrect and as a result it has been removed from all final site counts for this assessment.

Of the 303 newly recorded sites identified during the surveys undertaken for this assessment the majority were Open Camp Sites (172). The remaining site types are highlighted below in Table 15. Detailed descriptions of all inspected sites (including both previously and newly recorded sites) are provided in Annex 1.

All except one of the AHIMS registered sites of high scientific (archaeological) significance were inspected during the assessment. The low water level in Lake Burragorang meant that the site could not be accessed via boat and therefore required difficult access on foot in rough terrain.

Table 15 provides a summary of the number of sites and site types recorded during the survey (including newly recorded sites). The re-located AHIMS sites are outlined in Section 4.1, with newly recorded sites presented in Figure 22, Figure 23 and Figure 24.

The following site types are present within the PUIA:

- Shelter with Deposit, Artefacts and Axe Grinding Grooves- 1
- Shelter with Deposit and Artefacts-4
- Shelter with Deposit- 1

- Shelter with Deposit, Axe Grinding Grooves and Isolated Artefact-1
- Shelter with Art- 1
- Aboriginal Resource and Gathering-1
- Open Camp Site- 23
- Axe Grinding Grooves-4
- Stone Arrangement-1
- Isolated Artefact-6

A description of the individual sites recorded is presented in Sections 9.2.1 to Section 9.2.10 with further detail presented within Annex 1

Table 15: Summary of Aboriginal Sites located during the survey by site type

Site Type	Number of recorded sites	Percentage of Total Sites Surveyed
Aboriginal Ceremony and Dreaming	1	0.30%
Aboriginal Resource and Gathering	4	1.20%
Axe Grinding Grooves	8	2.40%
Isolated Artefact	21	6.29%
Open Camp Site	195	58.38%
Open Camp Site with Axe Grinding Grooves	1	0.30%
Open Camp Site with Axe Grinding Grooves and Isolated Artefact	2	0.60%
Open Camp Site with Axe Grinding Grooves and Scarred Tree	1	0.30%
Open Camp Site with Scarred Tree	8	2.40%
Scarred Tree	5	1.50%
Shelter with Art	3	0.90%
Shelter with Art and Artefacts	2	0.60%
Shelter with Art and Axe Grinding Grooves	3	0.90%
Shelter with Art, Artefacts and Axe Grinding Grooves	2	0.60%
Shelter with Artefacts and Axe Grinding Grooves	1	0.30%
Shelter with Axe Grinding Grooves	1	0.30%
Shelter with Deposit	6	1.80%
Shelter with Deposit and Art	3	0.90%
Shelter with Deposit and Artefacts	23	6.89%
Shelter with Deposit and Axe Grinding Grooves	7	2.10%
Shelter with Deposit and Isolated Artefact	2	0.60%
Shelter with Deposit, Art and Artefacts	10	2.99%
Shelter with Deposit, Art and Isolated Artefact	3	0.90%
Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	8	2.40%
Shelter with Deposit, Artefacts and Axe Grinding Grooves	5	1.50%
Shelter with Deposit, Artefacts, Axe Grinding Grooves and Tool Marks	1	0.30%
Shelter with Deposit, Axe Grinding Grooves and Isolated Artefact	2	0.60%
Shelter with Isolated Artefact	1	0.30%
Stone Arrangement	2	0.60%
Water Hole	1	0.30%

Site Type	Number of recorded sites	Percentage of Total Sites Surveyed
Water hole and Aboriginal Ceremony and Dreaming	2	0.60%
Total Number of Aboriginal Sites:	**334**	**100.00%**

Table 16: Features found at surveyed Aboriginal sites

Types of Features Found in Subject Area	Number of Sites with this Feature	Occurrence at Sites as a Percentage of Sites Surveyed
Artefact Scatters	248	55.11%
Axe Grinding Grooves	42	9.33%
Engravings	1	0.22%
Isolated Artefacts	30	6.67%
Rock Art	34	7.56%
Rockshelters	84	18.67%
Scarred Trees	6	1.33%
Stone Arrangement	2	0.44%
Water Hole	3	0.67%

The following creation story locations outlined in Table 17 and tributaries outlined in Table 18 were assessed as identified within the methodology. Thirty-one (31) of the sites were visited as part of this survey. The remaining 14 sites were not visited. Of these 14 sites, 2 were outside of the Subject Area, 5 sites were below the water level of the dam at time of survey and 7 could not be safely accessed during this assessment due to the low water level of the Warragamba Dam. All sites have been included in this assessment.

Table 17: Creation Story locations surveyed during the assessment

Gundungurra Cultural Landscape item number	Figure reference	Gundungurra Cultural Landscape item name	Surveyed	Reasoning
1	Figure 11	Birrigooroo Water Hole	Yes	
2	Figure 11	G's Journey	No	Could not be safely accessed in a single day, due to dam water levels
3	Figure 11	Kedumba Water Hole	Yes	
4	Figure 11	Rock Art	Yes	
5	Figure 11	G's Journey	Yes	
6	Figure 11	Hayes	No	Could not be safely accessed in a single day, due to dam water levels
7	Figure 11	Apple Tree Flat	No	Could not be safely accessed in a single day, due to dam water levels
8	Figure 11	Karrangatta Water Hole	No	Could not be safely accessed in a single day, due to dam water levels
9	Figure 11	Kowmung	No	Could not be safely accessed in a single day, due to dam water levels
10	Figure 11	Big Fight	No	Could not be safely accessed in a single day, due to dam water levels

Gundungurra Cultural Landscape item number	Figure reference	Gundungurra Cultural Landscape item name	Surveyed	Reasoning
11	Figure 11	Alum Springs Medicinal	Yes	
12	Figure 11	Burial	Yes	
13	Figure 11	Billagoola Water Hole	No	This location is not within the Subject Area
14	Figure 11	Illagoola	Yes	
15	Figure 11	Warrumba	Yes	
16	Figure 11	Cunnark Water Hole	Yes	
17	Figure 11	Rock Art	Yes	
18	Figure 11	Cooba	Yes	
19	Figure 11	Gung Gaung Water ole	Yes	
20	Figure 11	Gusabung	No	This location is not within the Subject Area
21	Figure 11	Gaung Water Hole	No	This location is not within the Subject Area
22	Figure 11	St Josephs	Yes	
23	Figure 11	Muggaroon	Yes	
24	Figure 11	Gogongolly	Yes	
25	Figure 11	Junda Water Hole	Yes	
26	Figure 11	Kouroong	Yes	
27	Figure 11	Ripple Creek	Yes	
28	Figure 11	Werriberrie	Yes	
29	Figure 10	Gurrabulla Water	No	This location is not within the Subject Area
30	Figure 11	Boonbat Water Hole	No	This location is not within the Subject Area
31	Figure 11	Bulla Mullar	No	This location is not within the Subject Area
32	Figure 11	Gunnadarel	No	This location is not within the Subject Area
33	Figure 11	Mullindar Water Hole	Yes	
34	Figure 11	Kweeoogang Water Hole	Yes	
35	Figure 10	Burials	Yes	
36	Figure 10	The Black Water Hole	Yes	
37	Figure 10	Sheeys Creek	Yes	
38	Figure 10	Nattai	Yes	
39	Figure 10	Goorit Water Hole	Yes	
40	Figure 10	Woonaggaree	Yes	
41	Figure 10	Burragorang	Yes	
42	Figure 10	Gunarlook Water Hole	Yes	
43	Figure 10	Jumping Woman	Yes	
44	Figure 10	Big Fight	Yes	
45	Figure 10	John Riley Burnt	No	Could not be safely accessed in a single day, due to dam water levels

Table 18: Tributaries identified as having archaeological potential in the methodology

Tributaries of archaeological potential identified in the methodology	Assessment details
Spring Creek	Partially surveyed within the Subject Area
Fern Creek	Partially surveyed within the Subject Area
Kedumba River	Partially surveyed within the Subject Area
Water Fall Creek	Partially surveyed within the Subject Area
Cedar Creek	Partially surveyed within the Subject Area
Singajjingwell Creek	Not surveyed as part of this assessment
Reedy Creek	Partially surveyed within the Subject Area
Cox River	Partially surveyed within the Subject Area
Kowmung River	Partially surveyed within the Subject Area
Lake Burragorang	Partially surveyed within the Subject Area
Tollbar Creek	Not surveyed as part of this assessment
Horse Arm Creek	Partially surveyed within the Subject Area
Alum Spring Creek	Partially surveyed within the Subject Area
Oaky Creek	Partially surveyed within the Subject Area
Ripple Creek	Partially surveyed within the Subject Area
Werriberri Creek	Partially surveyed within the Subject Area
Butchers Creek	Partially surveyed within the Subject Area
Green Wattle Creek	Partially surveyed within the Subject Area (South)
Green Wattle Creek	No surveyed as part of this assessment (North)
Fitz's Creek	Not surveyed as part of this assessment
Black Coola Creek	Not surveyed as part of this assessment
Bob Higgins Creek	Not surveyed as part of this assessment
Blossom Lodge	Not surveyed as part of this assessment
Dunns Gully	Not surveyed as part of this assessment
Ranger Creek	Not surveyed as part of this assessment
Tonalli Creek	Partially reviewed within the Subject Area
Nattai River	Partially reviewed within the Subject Area
Gillians Creek	Not surveyed as part of this assessment
Little Creek	Partially reviewed within the Subject Area
Jooriland River	Partially reviewed within the Subject Area
Wollondilly River	Partially reviewed within the Subject Area

9.2.1 Aboriginal Ceremony and Dreaming Sites

There was one site identified as relating to Aboriginal Ceremony and Dreaming locales but also not containing other features. It is located within the EUIA. Further information on this site can be found in Table 19 and Annex 1.

Plate 7: Landform at Warragamba-226 showing area associated with Guringatch's Journey

Plate 8: Landform at Warragamba-226

Table 19: Summary of Aboriginal Ceremony and Dreaming Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Aboriginal Ceremony and Dreaming Sites				
Figure 23	Pending	Warragamba-226	New Site 2019	Warragamba – 226 is an Aboriginal Ceremony and Dreaming site surrounding the Guringatch Journey story location at the junction of Cedar Creek and Coxs River. This junction marks a diversion along Gundungurra pathways through Cedar Valley to the Ruined Castle/ Jamison Valley area. Cedar Creek holds several significant rock art sites and a series of possible medicinal springs.

9.2.2 Aboriginal Resource Gathering Sites

A total of four sites were observed as the category of Aboriginal Resource Gathering, one of which falls within the Subject Area. These were three new sites recorded by Niche as part of this survey. They comprise of two medicinal gathering sites that contain Morle Boc- this is further discussed in Section 10.3, and a post-contact farm site with a continuous connection to the area dating back 100 years before the encroachment of Lake Burragorang in the 1950s. Further details and photographs of the registered site is outlined in Table 20, Table 21, Table 22 and Annex 1.

Plate 9: General view of Gunguarlook Farm Post-contact site at Warragamba-75

Plate 10: Detail of medicinal spring at Warragamba-233

Table 20: Aboriginal Resource Gathering Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Aboriginal Resource Gathering Sites within the EUIA				
Figure 22	Pending	Warragamba-05	Niche New Site 2018	The site is a limestone deposit that is eroding over the top of a sandstone and shale cliff-line. Some of this limestone connects to a small pool located within Little River, which is situated directly below the cliff-line. The cliff is approximately 20m in height and spans a length of 250m, and some of the limestone-flow deposit continues to the edge of the small pool. Due to the limestone feature and its close proximity to the small pool within Little River, it has been suggested that this is a potential medicinal site, and that the water contains medicinal properties use do heal an individual of particular ailments from this limestone spring. Further, this site is potentially connected the 'Gundungurra story'
Figure 23	Pending	Warragamba-179	Niche New Site 2018	Warragamba-179 is an Aboriginal Resource and Gathering site located beside the stored water and along a drainage line in the bay southwest of Warragamba-178. There was a deposit of 'Morle Boc [2]' found at this site.

Table 21: Aboriginal Resource Gathering Sites within the PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Aboriginal Resource Gathering Sites within the Subject Area				
Figure 23	Pending	Warragamba-233	Niche New Site 2019	Warragamba-233 is an Aboriginal Resource and Gathering Site, at which a spring that contains a Morle Boc deposit is present. Historic references to lock farmers using spring water for treating stomach complications based on local Aboriginal knowledge. The eroded rock overhang from which the spring issues contains numerous stalactites – limestone with mix of iron minerals.

Table 22: Aboriginal Resource Gathering Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Aboriginal Resource Gathering Sites outside the Subject Area				
Figure 22	Pending	Warragamba-75	Niche New Site 2018	Gungalook Farm. This site has post- contact significance to the Aboriginal community as the Riley family have over 100 years of historical association with the land until they were required to leave due to the rising waters of Lake Burragorang in the 1950's. The Riley family have continued their connection to the area through maintaining cultural traditions and custodianship. Ashes of family members are scattered here. The remains of the family home are located here. A further three stone tools were also observed at this location.

[2] Morle Boc is a deposit of limestone that was used medicinally in conjunction with the associated Water Hole by the Aboriginal people of the region

9.2.3 Axe Grinding Groove Sites

A total of eight sites consisting of only four axe grinding grooves which have been recorded within the PUIA, a further three fall within the existing EUIA and one is outside of the EUIA and PUIA. The sites fall across a variety of landforms. Further photographs of each of the axe grinding grooves are provided in Annex 1. Further details and photographs of the registered site is outlined in Table 23, Table 24, Table 25 and Annex 1.

Plate 11: Detail of Axe Grinding Grooves at Joorilan Creek (AHIMS ID#52-1-0045)

Plate 12: Detail of Axe Grinding Grooves at Warrragamba-228

Table 23: Axe Grinding Groove Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	No. of grooves	Recorded	Description
Records of Axe Grinding Groove Sites within the EUIA					
Figure 23	Pending	Warragamba-282	1	Niche New Site 2019	Warragamba-282 is an Axe Grinding Groove Site located on an isolated boulder along the waterline (within the stored water) of the riverbank between Warragamba-265 and Warragamba-264.The boulder itself measures 5m x 3.5m x 1.3mm. The single grinding groove measures 260 x 105 x 5mm.
Figure 23	Pending	Warragamba-290	1	Niche New Site 2019	Warragamba-290 is an Axe Grinding Grooves Site located on an alluvial creek bank. The grinding grooves are located beside an unnamed creek between Moody's and Commodore's hill. There is at least 1 grinding groove on a partially burned rock.
Figure 23	Pending	Warragamba-304	3	Niche New Site 2019	Warragamba-304 is an Axe Grinding Grooves site located on a sandstone platform at the eastern extremity of the ridgeline above Warragamba-302 and Warragamba-303. There were three grinding grooves found beside a surveyor's trig point.

Table 24: Axe Grinding Groove Sites within the PUIA

Figure Reference	AHIMS ID	Site Name	No. of grooves	Recorded	Description
Records of Axe Grinding Groove Sites within the Subject Area					
Figure 7	52-1-0045	Joorilan Creek, Upper Burragarang	18	David Bell: 18/06/1980	The site is situated 3 km north-east of the junction of the Wollondilly River and Jooriland Creek, in a creek bed located on the eastern side of Wollondilly River. This site contains two groups of axe grinding grooves situated within the sandstone bed of the creek. The first group comprises of three grooves, the second group are located approximately 36 meters downstream and contain a larger group of some 15 grooves. The axe grinding grooves from both groups range between 1-5cm in depth and 10-20cm in length.
Figure 23	Pending	Warragamba-83	2	Niche New Site 2018	The platform on which the grinding grooves are situated is 6 x 1.8 metres, the platform is an area of sandstone that is the situated on the Wollondilly River. There are two axe grinding grooves visible of sediment and vegetation growth over the platform. The largest groove size is 240 x 50 x 6 mm.
Figure 23	Pending	Warragamba-228	1	Niche New Site 2019	Warragamb-228 is an Axe Grinding Groove Site located downstream from Waggagamba-227, alongside the stored water in the Cox River. The single groove present at the site is located on a sandstone boulder.
Figure 23	Pending	Warragamba-114	27	Niche New Site 2018	The platform on which the grinding grooves are situated is 13 x 2 metres, the platform is an area of sandstone that is the situated on the Cox River. There are twenty-seven axe grinding grooves visible of sediment and vegetation growth over the platform.

Table 25: Axe Grinding Groove Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	No. of grooves	Recorded	Description
Records of Axe Grinding Groove Sites outside the Subject Area					
Figure 8	45-4-0966	Ashtons 1	12	AHIMS Site Card	Ashtons 1 is an Axe Grinding Groove Site which is located 200m from the Cox River. It comprises 12 axe grinding grooves, in several groups. The sandstone surface on which the groves are located shows evidence of cracking and possible cultural markings.

9.2.4 Engraving Sites

There is one site which features engravings identified within the EUIA. There are no engraving sites within the PUIA. Further details and photographs of the registered site is outlined in Table 26 and Annex 1, although this site was not located, as the original positioning information was not accurate.

Table 26: Summary of Engraving Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Record of Engraving Sites				
Figure 7	52-1-0008	Byrnes Creek	AHIMS Site Card 1958	This is an Engraving Site noted on site card 52-1-0008 as being located on the right bank of Byrnes Creek, recorded as an engraving of a bird 6ft, 2in long by Robert Hamilton Matthews around c1900. A member of the Gundungurra tribe, George Riley, informed Matthews that he remembered seeing the engraving from childhood.
				For this survey, the field team was unable to re-locate this site, as it is likely that the location has been covered since the Wollondilly River Valley was flooded.

9.2.5 Isolated Artefact

A total of six Isolated Artefact sites were located within the PUIA. In addition to this 9 were within the EUIA and 6 outside of the PUIA and EUIA. Many of these sites were characterised by poor exposure indicating further artefacts may be present. Several isolated artefact sites were identified as having potential to contain additional subsurface artefacts. Further details and photographs of relocated registered site are outlined in Table 27, Table 28, Table 29 and Annex 1.

Plate 13: General view of landform at Warragamba-64, Isolated Artefact site

Plate 14: Detail of isolated artefact found at Warragamba-90

Table 27: Isolated Artefact sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Record of Isolated Artefact Sites within the EUIA				
Figure 22	Pending	Warragamba-77	Niche New Site 2018	This site comprises of an Isolated Artefact on the bank of the Wollondilly River.
Figure 22	Pending	Warragamba-121	Niche New Site 2018	Warragamba 121 is an Isolated Artefact comprising of a basalt axe. The site is located on an island within the Cox's River.
Figure 22	Pending	Warragamba-125	Niche New Site 2018	Warragamba 125 comprises of a single basalt axe. The site is located on the bank of the Cox's River.
Figure 22	Pending	Warragamba-126	Niche New Site 2018	Warragamba 126 comprises of a single basalt core. The site is located on the bank of the Cox's River.
Figure 22	Pending	Warragamba-130	Niche New Site 2018	Warragamba 130 comprises of a single basalt core. The site is located on the bank of the Cox's River.
Figure 22	Pending	Warragamba-143	Niche New Site 2018	Warragamba 143 is an Isolated Artefact located on the Cox River consisting of a single platform core.
Figure 22	Pending	Warragamba-183	Niche New Site 2019	Warragamba-183 is an Isolated Artefact located beside the stored water on the eastern side of Maxwell's Point. A single chert core was located at this site.
Figure 22	Pending	Warragamba-198	Niche New Site 2019	Warragamba-198 is an Isolated Artefact located on a spur north of the landform were Warragamba-197 is situated. The artefact located during this survey was a single platform basalt core.
Figure 22	Pending	Warragamba-269	Niche New Site 2019	Warragamba-269 is an Isolated Artefact site located on a spur at the junction of Oaky Creek and the Cox River. Warragamba-268 is located further to the northeast, and the artefact discovered was a core made from quartzite.

Table 28: Isolated Artefact sites within the PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Record of Isolated Artefact Sites within the Subject Area				
Figure 22	Pending	Warragamba-88	Niche New Site 2018	Warragamba 88 is an Isolated Artefact on the bank of Byrnes Creek.
Figure 22	Pending	Warragamba-101	Niche New Site 2018	This Isolated Artefact is located on Tonalli Cove and comprises of a large chert core. Visibility and exposure was low, giving the site a likelihood of more artefacts being present.
Figure 22	Pending	Warragamba-102	Niche New Site 2018	This Isolated Artefact is located the valley flat at Tonalli Cove. Visibility and exposure was low, giving the site a likelihood of more artefacts being present. The artefact was exposed by a wombat burrowing.
Figure 22	Pending	Warragamba-64	Niche New Site 2018	This Isolated Artefact is just west of Warragamba 63. The site comprises of a single chert core.
Figure 22	Pending	Warragamba-78	Niche New Site 2018	This site comprises of an Isolated Artefact on the bank of the Wollondilly River.
Figure 22	Pending	Warragamba-108	Niche New Site 2018	Warragamba 108 is on Isolated Artefact. The artefact comprises of a chert flake. The site is located 50 m north of Warragamba 107.

Table 29: Isolated Artefact sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Record of Isolated Artefact Sites outside the Subject Area				
Figure 22	Pending	Warragamba-13	Niche New Site 2018	This site comprises of an Isolated Artefact on top of a ridge, approximately 1.7 km from the Nattai and Little River Junction and within a few hundred meters of Nattai River
Figure 22	Pending	Warragamba-73	Niche New Site 2018	This site is an Isolated Artefact located just off the Wollondilly River.
Figure 22	Pending	Warragamba-103	Niche New Site 2018	This Isolated Artefact is located the valley flat at Tonalli Cove. Visibility and exposure were low, giving the site a likelihood of more artefacts being present.
Figure 22	Pending	Warragamba-90	Niche New Site 2018	Warragamba 90 is an Isolated Artefact site on the bank of a drainage line of Byrnes Creek.
Figure 22	Pending	Warragamba-162	Niche New Site 2018	Warragamba – 162 is an Isolated Artefact Site located 150m North of Jerry O'Leary point alongside the stored water of Warragamba Dam. There was a single Chert Flake found due to wombat disturbance, however it is likely that there are other artefacts present on this site.
Figure 22	Pending	Warragamba-134	Niche New Site 2018	Warragamba 134 comprises of a single basalt hatchet. The site is located on the bank of the Cox's River.

9.2.6 Open Camp Sites

There are 207 open camp sites identified within the area that was surveyed. A total of 143 sites are located within the EUIA, whilst 23 sites are located within the PUIA and a further 41 sites are positioned outside the EUIA and PUIA. These sites are usually identified by artefact scatters but could also be associated with Scarred Trees. This site type is the most prevalent found in this survey, with many of these sites located on flatter landforms which command views of the surrounding open terrain. These sites would have held higher positions within the landscape relative to the water levels in each valley in antiquity. Further details and photographs of each registered site are outlined in Table 30, Table 31, Table 32 and Annex 1.

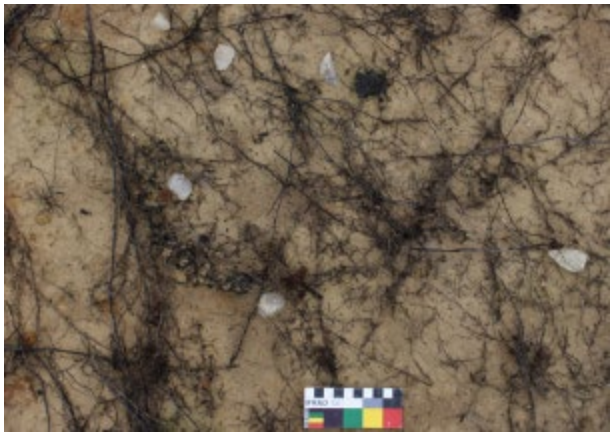


Plate 15: Detail of artefacts found in situ at Green Wattle Point (AHIMS #52-01-0136)

Plate 16: General view of landform at the open camp site Warragamba-230

Table 30: Summary of Open Camp Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Open Camp Sites				
Figure 8, Figure 20	45-4-0191	Grahams Landing	AHIMS Site Card	Grahams Landing is an Open Camp Site located on a spur next to the stored water. There were 10 artefacts re-located at this site.
Figure 7, Figure 19	52-1-0345	Green Wattle Point OS-1	AHIMS site card- P. Hunt (20/05/2000)	This site comprises of an Open Camp Site positioned across a spur, west of Green Wattle Point (AHIMS ID#52-01-0136) and close to Lake Burragorang and the Wollondilly River.
Figure 8, Figure 20	45-4-0930	CA1; Warragamba Dam Special Area	AHIMS Site Card	Originally recorded in 2000 as an artefact scatter/contact site, the site was observed to contain a high density of artefacts, including potential glass and ceramic artefacts. These potential glass and ceramic artefacts included: pink, dark purple, dark green, and clear glass and varied types of ceramics with a varied measurement of <30mm and containing evidence of retouch. Raw materials included both quartz and chert, with stone tools types including flakes, scrapers, and blades.
Figure 8, Figure 20	45-4-0931	EH 1; Warragamba Special Area	AHIMS Site Card 1998	The survey relocated the site and it appears to be in a state of good preservation. No glass was relocated, stone tool types included an axe, flakes, and cores.
Figure 7, Figure 19	52-1-0136	Green Wattle Point	AHIMS site card- H. Brayshaw & J McDonald	This site is an Open Camp Site located on a broad spur ridge close to Green Wattle Point located to the south. The site extends across the ridge line approximately 400m to the south and 100m to the east and west, with a portion of the scatter evident within a meter of a high-water mark of Lake Burragorang to the north. Raw material types visible on the surface include quartzite, chert, and silcrete and are found as sparse scatters within a large area of the landscape (i.e. three artefacts per square meter on average across the site boundary). This site has been previously recorded in 1989 and appears to be in a good state of preservation if comparing to the original survey conducted.
Figure 7, Figure 19	52-1-0186	W223, Byrnes Creek	AHIMS site card G. Reardon 1998	W223 Byrnes Creek is an Open Camp Site with artefacts located on the lakeshore of Warragamba Catchment near Byrnes Bay. The initial recording of this site was by G. Reardon in January of 1998 and artefacts including mudstone, chert and quartzite partial and complete flakes were observed, but not recorded at that time.
Figure 7, Figure 19	52-1-0236	Burra Lake Flake 1	AHIMS site card- R. Chalker (2005)	This site is located on a broad spur approximately 10m above the high-water mark of Lake Burragorang, in between Kamilaroi and Gorman Points. This is an Open Camp Site and has been noted during survey work as relating to the Gundungurra story 'The hand that tries to draw the Waratah' and is positioned close to 'The Black Waterhole' in the Hinterland, where Nulla Nulla washed himself (Smith 2016:248). This site contains a high concentration of artefacts that extend across the spur and is likely to continue underneath the high watermark. Further, due to the high presence of surface finds, it is highly likely that subsurface finds will be present. Originally recorded by Rebecca Chalker (2005), the survey revealed the site to have good preservation and surface finds continued to have a high concentration of stone tools. The raw materials included: chert, quartzite, basalt and quartzite, and stone tools types included flakes, retouched flakes, and cores.
Figure 7, Figure 19	52-1-0332	Byrnes Bay OS-1	AHIMS site card- (P. Hunt 1998)	This site is an extensive Open Camp Site located south of Byrnes Bay on the Wollondilly River and extends for 250 m. The site was originally recorded in 1998 by Phil Hunt is a high concentration of artefacts, a sample of 14 artefacts were recorded as part of this assessment.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 7, Figure 19	52-1-0352	Tonalli OS-1	AHIMS site card- P. Hunt (23/10/1998)	The site comprises of an Open Camp site on Tonalli Point. Recorded in 1998 the site card lists several stone artefacts made of yellow and grey banded chert. The artefacts were listed as being cores and flakes. During the survey the artefacts were not re-recorded, however the site is noted as being in the same condition as the original AHIMS site recording.
Figure 7, Figure 19	52-1-0130	Tonalli Cove 1	AHIMS Site Card McDonald Williams 1989	Tonalli Cove 1 is an Open Camp Site with artefacts located on a spur which protrudes into the Tonalli River. There were 6 artefacts re-located during this survey.
Figure 7, Figure 19	45-4-0946	TR1	AHIMS Site Card T. Kowder 1998	TR 1 is an Open Camp Site with artefacts found at the confluence of Wollondilly and Tonalli Rivers. The site is located at the top of a ridge between the two water sources, and artefact types located at the site include cores, flakes, broken axes, hammerstones and scrapers. These are made from a large variety of material including quartzite, quartz, silcrete, basalt, mudstone, and chert. The site was originally recorded by T. Kowder in October 1998.
Figure 22, Figure 23	Pending	Warragamba-15	Niche New Site 2018	This is an Open Camp Site situated on a small island within Lake Burragorang, in between Kamilaroi and Gorman Point. This site extends along a saddle to the south, which is usually underneath the water level, and is subsequently subject to seasonal change. At the time of the survey, this site was above the water level mark by approximately 10-20m. This site is situated within close proximity to Site Burra Lake Flake 1 (AHIMS ID#52-1-0236) and Kamilaroi Point (AHIMS ID# 52-1-0142), located south-east of this open camp site and is within the impact zone, and is within 200m of Site: Warragamba 16 (AHIMS ID# pending) to the east.
Figure 22, Figure 23	Pending	Warragamba-17	Niche New Site 2018	This site comprises of an Open Camp Site situated on a lower ridge, very close to the high-water mark of Lake Burragorang. This site is located within close proximity to Warragamba 16 (AHIMS ID pending) Artefacts are visible across the surface of exposure both above and below the high water mark, resulting in this site being subject to constant water wash from seasonal variability in the fluctuating water level of the Lake.
Figure 22, Figure 23	Pending	Warragamba-18	Niche New Site 2018	This is an Open Camp Site situated along the lower base of a ridge, close to Gorman Point to the north-east and within very close proximity of Site: Warragamba-17 (AHIMS ID pending) to the north-west. This site is a low-density artefact scatter that extends above and below the high watermark of Lake Burragorang. The site extends across the shoreline of the lake approximately 150m east to west, with raw materials of chert, basalt, and quartz flakes, coupled with some hearth material and burnt clay scattered atop the surface. Due to the sites proximity to the high watermark and evidence of past vegetation clearing for farming, has resulted in some disturbance to this site.
Figure 22, Figure 23	Pending	Warragamba-19	Niche New Site 2018	This is an Open Camp Site situated on the lower slope of a ridge, approximately 20m above the high watermark of Lake Burragorang. The site is 850m west of Murrungurry Point and 710m east of Gorman Point. Artefacts evident on the ground surface include raw materials of chert and quartz and there is a high possibility that this site extends below the watermark.
Figure 22, Figure 23	Pending	Warragamba-20	Niche New Site 2018	This is an Open Camp Site situated on the mid-slope of a spur approximately 450m from Site: Warragamba-19 (AHIMS ID pending). A low density of artefacts made from basalt and quartz are evident atop the surface close to the high watermark of Lake Burragorang and east of Murrungurry Point. The surrounding landscape is an open woodland including native cherry and a canopy dominated by Ironbark trees. Evidence of recent modern materials scatter the immediate area of this site and include metal pipes, bricks, and hoses. Further, this site shows continual signs of water erosion due to its proximity to the high watermark of Lake Burragorang.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-21	Niche New Site 2018	This is an Open Camp Site comprising of a small artefacts scatter located along the lower slope of a spur, close to Murrungurry Point to the north-east and directly below an old road to the south. Three quartz artefacts were evident on the ground surface of land, previously cleared for farming. It is highly likely that this site extends below the high watermark of Lake Burragorang, towards the Nattai River.
Figure 22, Figure 23	Pending	Warragamba-22	Niche New Site 2018	This is an Open Camp Site situated along the spur of a ridgeline close to and below the high watermark of Lake Burragorang. This site is positioned north of Kamilaroi Point (AHIMS ID#52-1-0142) and approximately 100m north-west of the main ridgeline. This is an artefact scatter varies in density across the landscape and the main raw materials exploited are quartz and chert. It is highly likely that this site extends well below the water level of Lake Burragorang due to the artefacts located so close to the edge of the water table.
Figure 22, Figure 23	Pending	Warragamba-23	Niche New Site 2018	This Open Camp Site is positioned on a broad ridge on the edge of Lake Burragorang. The site comprises of six stone artefacts made of basalt and chert.
Figure 22, Figure 23	Pending	Warragamba-24	Niche New Site 2018	This Open Camp Site is positioned on a broad ridge on the edge of Lake Burragorang. The site comprises of six stone artefacts made of basalt and chert. These artefacts were observed eroding out of the bank of the lake.
Figure 22, Figure 23	Pending	Warragamba-25	Niche New Site 2018	This Open Camp Site is positioned on a broad ridge on the edge of Lake Burragorang. The site comprises of twelve stone artefacts made of basalt and chert. These artefacts were observed eroding out of the bank of the lake.
Figure 22, Figure 23	Pending	Warragamba-26	Niche New Site 2018	This Open Camp Site is positioned on a broad ridge on the edge of Lake Burragorang. The site comprises of ten stone artefacts made of silcrete, quartz and chert. These artefacts were observed eroding out of the bank of the lake. Only a sample of the artefacts present at the site were recorded.
Figure 22, Figure 23	Pending	Warragamba-27	Niche New Site 2018	This Open Camp Site is positioned at Kamilaroi Point, just above the high-water mark of Lake Burragorang. The site measures 150 m x 250 m. A sample of six artefacts were recorded at this site.
Figure 22, Figure 23	Pending	Warragamba-28	Niche New Site 2018	This Open Camp Site is positioned on a north west running spur, along a road exposure. The artefacts are located just above the high-water mark of Lake Burragorang. The site measures 50 m x 50 m. A sample of ten artefacts were recorded at this site.
Figure 22, Figure 23	Pending	Warragamba-29	Niche New Site 2018	This Open Camp Site is positioned north east of Carlon Point. The area has previously been cleared of vegetation. The site consists of three stone artefacts made of chert.
Figure 22, Figure 23	Pending	Warragamba-30	Niche New Site 2018	This Open Camp Site is on a spur west of Carlon Point. Many stone artefacts were observed, and several were recorded as part of this assessment. Artefacts were observed at the edge of the high-water mark and are likely to extend 80 m past this mark, however visibility hindered this assessment.
Figure 22, Figure 23	Pending	Warragamba-33	Niche New Site 2018	This Open Camp Site is just off an access track, 130 m off the high-water mark of Lake Burragorang. The site comprises of twelve stone artefacts made from quartz, basalt, and chert.
Figure 22, Figure 23	Pending	Warragamba-34	Niche New Site 2018	This medium density Open Camp Site is positioned 250 south of the high-water mark of Lake Burragorang. The site measures 100 m x 250 m. There is a lot of modern glass (purple and green) present at this site, as well as bricks and old building materials. A sample of nine artefacts were recorded as part of this assessment.
Figure 22, Figure 23	Pending	Warragamba-35	Niche New Site 2018	This Open Camp Site is positioned on a north running ridge west of an inlet that runs into Lake Burragarong. The site comprises of five stone artefacts.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-36	Niche New Site 2018	This Open Camp Site is positioned north east along a spur. The site comprises of twelve stone artefacts comprising of chert, basalt, and quartz.
Figure 22, Figure 23	Pending	Warragamba-37	Niche New Site 2018	This Open Camp Site is positioned 250 m from the high-water mark of Lake Burragorang. The site comprises of five artefacts, two of which are axes.
Figure 22, Figure 23	Pending	Warragamba-38	Niche New Site 2018	This Open Camp Site is located on abroad spur/ ridgeline approximately 500 m off the access road. The site comprises of a low-density artefact scatter. A sample of ten artefacts were recorded during this assessment.
Figure 22, Figure 23	Pending	Warragamba-39	Niche New Site 2018	Warragamba 39 is an extensive Open Camp Site comprising of an area of more than 30 sq. metres. The site comprises of stone artefacts as well as burnt clay. The site is located just off Lake Burragorang foreshore on a spur. As part of this assessment a sample of twenty-five artefacts were recorded.
Figure 22, Figure 23	Pending	Warragamba-40	Niche New Site 2018	Warragamba 40 is an extensive Open Camp Site comprising of an area of 200 m x 200 m. The site comprises of stone artefacts. The site is located just off Lake Burragorang's foreshore on a spur. As part of this assessment a sample of eighteen artefacts were recorded.
Figure 22, Figure 23	Pending	Warragamba-41	Niche New Site 2018	Warragamba 41 is an extensive Open Camp Site located on a mostly level ridgeline. The site is associated with the eastern hinterland of an area known as 'Burragorang' after the giant kangaroo from the dreaming- the place where the valley gets its entire name from (Jackson 2018). A sample of ten artefacts were recorded at this site during this assessment.
Figure 22, Figure 23	Pending	Warragamba-42	Niche New Site 2018	This Open Camp Site is positioned on the shore of Lake Burragorang. The site comprises of eleven stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-43	Niche New Site 2018	This Open Camp Site is positioned on the shore of Lake Burragorang. The site comprises of six stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-44	Niche New Site 2018	This Open Camp Site is positioned on the shore of Lake Burragorang. The site comprises of five stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-45	Niche New Site 2018	This Open Camp Site is positioned on the shore of Lake Burragorang. The site comprises of eight stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-47	Niche New Site 2018	This Open Camp Site is positioned on the shore of Lake Burragorang. The site comprises of nine stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-48	Niche New Site 2018	Warragamba 48 is an extensive Open Camp Site that includes six axes, numerous cores over an area of 220 m x 250 m. A sample of twenty-four artefacts were recorded at this location.
Figure 22, Figure 23	Pending	Warragamba-49	Niche New Site 2018	Warragamba 49 is an Open Camp Site comprising of three stone artefacts
Figure 22, Figure 23	Pending	Warragamba-50	Niche New Site 2018	Warragamba 50 is an Open Camp Site comprising of four stone artefacts.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-51	Niche New Site 2018	Warragamba 50 is an Open Camp Site comprising of six stone artefacts. This site is located on the Wollondilly River flood corridor.
Figure 22, Figure 23	Pending	Warragamba-81	Niche New Site 2018	This Open Camp Site is located on the bank of the Wollondilly River. The site comprises of two stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-82	Niche New Site 2018	This Open Camp Site is 150 m north Warragamba 82. The site comprises of four stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-85	Niche New Site 2018	This Open Camp Site is located on a spur just adjacent to an unnamed drainage line of the Wollondilly River. The site comprises of three stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-86	Niche New Site 2018	Warragamba 86 is an Open Camp Site that extends 50 m x 50 m just at the edge of the high-water mark on the Wollondilly River. The site comprises of 3 stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-94	Niche New Site 2018	This Open Camp Site is located on the Wollondilly River and extends for 180 m x 300 m. The site is a high concentration of artefacts, a sample of 10 artefacts were recorded as part of this assessment.
Figure 22, Figure 23	Pending	Warragamba-95	Niche New Site 2018	This Open Camp Site is located on the western side of Tonalli Point and extends 120 m x 130 m. The site comprised of 5 artefacts.
Figure 22, Figure 23	Pending	Warragamba-96	Niche New Site 2018	This Open Camp Site is located on the western side of Tonalli Point and extends 250 m x 50 m. The site comprised of 2 artefacts, however there is likely to be subsurface deposit.
Figure 22, Figure 23	Pending	Warragamba-99	Niche New Site 2018	This Open Camp Site is located on the Tonalli River. The site comprises of three stone artefacts
Figure 22, Figure 23	Pending	Warragamba-105	Niche New Site 2018	Warragamba 105 is an Open Camp Site located at a spur of Byrnes Bay. The site comprises of two stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-106	Niche New Site 2018	Warragamba 106 is an Open Camp Site extending 100 m x 100 m. A sample of 11 artefacts were recorded for the purpose of this assessment.
Figure 22, Figure 23	Pending	Warragamba-107	Niche New Site 2018	Warragamba 107 is an Open Camp Site extending 100 m x 20 m. The site comprises of two stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-109	Niche New Site 2018	Warragamba 109 is an extensive Open Camp Site that is connected to Warragamba 110 and Warragamba 48 (located on the opposite bank of the Wollondilly River). A sample of 25 artefacts were recorded during this assessment.
Figure 22, Figure 23	Pending	Warragamba-111	Niche New Site 2018	Warragamba 111 is an Open Camp Site comprising of three stone artefacts. The site extends 100 m x 50 m and is located within the remains of Summer Hill Farm.
Figure 22, Figure 23	Pending	Warragamba-117	Niche New Site 2018	Warragamba 117 is an Open Camp Site comprising of eleven stone artefacts on a spur of the Cox's River. The site extends 100 m x 50 m.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-118	Niche New Site 2018	Warragamba 118 is an Open Camp Site comprising of six stone artefacts on a spur of the Cox's River. The site extends 50 m x 50 m.
Figure 23	Pending	Warragamba-119	Niche New Site 2018	Warragamba 119 is an Open Camp Site comprising of two stone artefacts on a spur of the Cox's River. The site extends 130m x 50m.
Figure 23	Pending	Warragamba-122	Niche New Site 2018	Warragamba 122 is an Open Camp Site comprising of six stone artefacts. The site is located on an island within the Cox's River.
Figure 23	Pending	Warragamba-123	Niche New Site 2018	Warragamba 123 is an extensive Open Camp Site. During this assessment a sample of 14 artefacts have been recorded. The site is located on an island within the Cox's River.
Figure 23	Pending	Warragamba-124	Niche New Site 2018	Warragamba 124 is an Open Camp Site. The site comprises of three stone artefacts. The site is located on the bank of the Cox's River.
Figure 23	Pending	Warragamba-127	Niche New Site 2018	Warragamba 127 is an Open Camp Site comprising of four stone artefacts. The site extends 100 m x 200m and is located on the bank of the Cox's River.
Figure 23	Pending	Warragamba-128	Niche New Site 2018	Warragamba 128 comprises of an Open Camp Site. During this assessment a sample of four artefacts were recorded at this site. The site is located on the bank of the Cox's River.
Figure 23	Pending	Warragamba-129	Niche New Site 2018	Warragamba 129 comprises of an extensive Open Camp Site. During this assessment a sample of four artefacts were recorded at this site. The site is located on the bank of the Cox's River.
Figure 23	Pending	Warragamba-140	Niche New Site 2018	Warragamba 140 is open camp site with artefacts located on a ridge on the west side of Butchers Creek. Two artefacts were located at this site.
Figure 23	Pending	Warragamba-141	Niche New Site 2018	Warragamba 141 is an open camp site with artefacts located on a ridge next to the stored water on Butchers Creek. Seven artefacts were located at this site.
Figure 23	Pending	Warragamba-142	Niche New Site 2018	Warragamba 142 is an open camp site with artefacts located on a ridge next to the stored water on Butchers Creek on the opposite bank from Warragamba 141. Seven artefacts were located at this site.
Figure 22, Figure 23	Pending	Warragamba-146	Niche New Site 2018	Warragamba 146 is an open camp site with artefacts located across an area leading toward Houlouhan Point, beside the stored water.
Figure 22, Figure 23	Pending	Warragamba-147	Niche New Site 2018	Warragamba 147 is an Open Camp Site with artefacts located across a point beside the stored water. It consists of 4 artefacts.
Figure 22, Figure 23	Pending	Warragamba-152	Niche New Site 2018	Warragamba – 152 is an Open Camp Site with artefacts located on the lower slope of a point beside the stored water and is directly west of an unnamed track inside the impact corridor.
Figure 22, Figure 23	Pending	Warragamba-155	Niche New Site 2018	Warragamba – 155 is an Open Camp Site with artefacts located on a point between an unnamed creek and Woodville point, and directly north of Warragamba 154. Among the artefacts present are three ground-edge axes.
Figure 22, Figure 23	Pending	Warragamba-156	Niche New Site 2018	Warragamba – 156 is an Open Camp Site with artefacts located alongside the stored water on a large, flat area which comprises Woodville point, and is north of the landform containing Warragamba – 155. An extensive artefact scatter was observed in this region, with a representative sample of 20 artefacts recorded. This point is at the mid-point of the valley it resides in.
Figure 22, Figure 23	Pending	Warragamba-157	Niche New Site 2018	Warragamba – 157 is an Open Camp Site with artefact scatter located between two unnamed creek-lines further north along the stored water from Woodville point and Warragamba – 156.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-160	Niche New Site 2018	Warragamba – 160 is an Open Camp Site with artefacts located alongside the stored water and North of the Warragamba – 159. The artefact scatter is of medium density.
Figure 22, Figure 23	Pending	Warragamba-164	Niche New Site 2018	Warragamba – 164 is an Open Camp Site with artefacts located 340m North West of Warragamba – 163, alongside the stored water. There were 4 artefacts located during this survey.
Figure 22, Figure 23	Pending	Warragamba-167	Niche New Site 2018	Warragamba – 167 is an Open Camp Site with artefact scatter located on a spur immediately south of Irish Bay, alongside the stored water at Warragamba Dam. Seventeen artefacts were located during this survey.
Figure 22, Figure 23	Pending	Warragamba-169	Niche New Site 2018	Warragamba – 169 is an Open Camp Site with artefacts located in Irish Bay alongside the stored water, and across an unnamed creek from Warragamba – 168. Eleven artefacts were located during this survey.
Figure 22, Figure 23	Pending	Warragamba-170	Niche New Site 2018	Warragamba – 170 is an Open Camp Site with artefacts located on the central spur in Irish Bay, alongside the stored water. There were 8 artefacts located as part of this survey.
Figure 22, Figure 23	Pending	Warragamba-171	Niche New Site 2018	Warragamba – 171 is an Open Camp Site with artefact scatter located on the North side of Irish Bay, on a spur alongside the stored water. There were 12 artefacts located during this survey.
Figure 23	Pending	Warragamba-173	Niche New Site 2019	Warragamba-173 is an Open Camp Site with artefacts located beside the stored water and in the same landform ass Broken Rock Point. There were seven artefacts located at this site.
Figure 23	Pending	Warragamba-174	Niche New Site 2019	Warragamba-174 is an Open Camp Site with artefacts located beside the stored water and in the bay west of Broken Rock Point. There were two artefacts located in this survey.
Figure 23	Pending	Warragamba-175	Niche New Site 2019	Warragamba-175 is an Open Camp Site with artefacts located beside the stored water and on the point north of Warragamba-174. There were five artefacts located during this survey.
Figure 23	Pending	Warragamba-176	Niche New Site 2019	Warragamba-176 is an Open Camp Site with artefacts located beside the stored water and located on a point north west of Warragamba-175. There were four artefacts located during this survey.
Figure 23	Pending	Warragamba-177	Niche New Site 2019	Warragamba-177 is an Open Camp Site with artefacts located beside the stored water and on a point north of Warragamba-178. There were four artefacts located at this site.
Figure 23	Pending	Warragamba-178	Niche New Site 2019	Warragamba-178 is an Open Camp Site with artefacts located beside the stored water and on a point west of Warragamba-177. There were four artefacts found at this site.
Figure 23	Pending	Warragamba-180	Niche New Site 2019	Warragamba-180 is an Open Camp Site with artefacts located beside the stored water and on the eastern side of Maxwell point. There were four artefacts located during this survey.
Figure 23	Pending	Warragamba-184	Niche New Site 2019	Warragamba-184 is an Open Camp Site located on a broad spur south west of Maxwell's Point, beside the stored water at Lacy's Bay. There was a scatter of nine artefacts found a part of this survey.
Figure 23	Pending	Warragamba-185	Niche New Site 2019	Warragamba-185 is an Open Camp Site with Artefacts located on a spur between drainage lines beside the stored water at Lacy's bay, 480m west of Maxwell's Point. There were four artefacts located at this site.
Figure 23	Pending	Warragamba-186	Niche New Site 2019	Warragamba-186 is an Open Camp Site with Artefacts located between two drainage lines on a spur beside the stored water west of Maxwell's Point. There were four artefacts located during this survey.
Figure 23	Pending	Warragamba-188	Niche New Site 2019	Warragamba-188 is an Open Camp Site with Artefacts, located on a spur beside the stored water in Lacy's Bay. There was a minor concentration of two artefacts located during this survey.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-189	Niche New Site 2019	Warragamba-189 is an Open Camp Site with Artefacts located south east of Warragamba-190, at the entrance to Lacy's Bay beside the stored water at Lake Burragorang. There was a minor concentration of four artefacts were located during this survey, although the large percentage of gravel coverage decreased visibility for artefacts at this site.
Figure 23	Pending	Warragamba-194	Niche New Site 2019	Warragamba-194 is an Open Camp Site with Artefact Scatter located on a point west of Bimlow Point, beside the stored water. There were three single platform basalt cores found during the site assessment.
Figure 23	Pending	Warragamba-195	Niche New Site 2019	Warragamba-195 is an Open Camp Site with Artefact Scatter located beside the stored water on a spur at Bimlow Point. Warragamba-196 is located on the landform to the north across an unnamed tributary of Lacy's creek. There were eight artefacts located during this survey, including a basalt single-platform core.
Figure 23	Pending	Warragamba-199	Niche New Site 2019	Warragamba-199 is an Open Camp Site with artefact scatter located north of Warragamba-198 beside the stored water at Lake Burragorang. The shelter site Warragamba-200 is located directly north and on a spur above Warragamba-199. There were eight artefacts located during this survey, including two basalt cores.
Figure 23	Pending	Warragamba-201	Niche New Site 2019	Warragamba-201 is an Open Camp Site with artefact scatter located on a landform 480m north of Warragamba-200. There were five artefacts located as part of this assessment, including flakes and cores made from quartz and chert, and a basalt hammerstone.
Figure 23	Pending	Warragamba-202	Niche New Site 2019	Warragamba-202 is an Open Camp Site with artefact scatter located beside the stored water near the junction of Lacy's Creek and the Wollondilly River. There were 13 artefacts found during this survey, including some of various types made from basalt. These were a sample of the many artefacts visible on this landform.
Figure 23	Pending	Warragamba-203	Niche New Site 2019	Warragamba-203 is an Open Camp Site with artefact scatter located beside the stored water of the Wollondilly River, on the opposite bank from Steven's Point. There were six artefacts located during this survey, including a basalt bi-facial core, and a basalt single platform core.
Figure 23	Pending	Warragamba-204	Niche New Site 2019	Warragamba-204 is an Open Camp Site with artefacts located immediately north of Warragamba-203, separated from that site's landform by an unnamed tributary of the Wollondilly River. Out of the four artefacts identified at this site, half of these were basalt single-platform cores.
Figure 23	Pending	Warragamba-205	Niche New Site 2019	Warragamba-205 is an Open Camp Site with artefact scatter located beside the stored water on a spur north of Warragamba-205. There were 10 artefacts located during this assessment, including a mixture of cores and a flake made from basalt, as well as chert flakes and a quartz core.
Figure 23	Pending	Warragamba-210	Niche New Site 2019	Warragamba-is an Open Camp Site located beside the stored water along the Wollondilly River, south of Blattmann Point. There were nine artefacts located at the site, including two made from volcanic material.
Figure 23	Pending	Warragamba-212	Niche New Site 2019	Warragamba-212 is an Open Camp Site located 400m south of Blattmann Point, directly west-north-west of Warragamba-211 beside the stored water. There was a sample of 12 artefacts located, including several made from basalt.
Figure 23	Pending	Warragamba-213	Niche New Site 2019	Warragamba-213 is an Open Camp Site with artefacts beside the stored water south of Blattmann Point. There were 15 artefacts located at this site, including several made from basalt.
Figure 23	Pending	Warragamba-214	Niche New Site 2019	Warragamba-214 is an Open Camp Site with artefacts located beside the stored water south-west of Blattmann Point. There were four artefacts located as part of this assessment.
Figure 23	Pending	Warragamba-215	Niche New Site 2019	Warragamba-215 is an Open Camp Site with artefacts located beside the stored water north of Blattmann Point. There were four artefacts recorded during this survey.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-216	Niche New Site 2019	Warragamba-216 is an Open Camp Site with artefacts located beside the stored water 400m southwest of Bellbird Point. There were ten artefacts recorded during this survey, including a basalt single-platform core.
Figure 23	Pending	Warragamba-217	Niche New Site 2019	Warragamba-217 is an Open Camp Site with artefacts located 260m south-west of Bellbird Point beside the stored water. There were eight artefacts located at this site, including two basalt cores.
Figure 23	Pending	Warragamba-221	Niche New Site 2019	Warragamba-221 is an Open Camp Site with artefacts located 660m south of Junction Point. There were six artefacts recorded during this survey, including four made from basalt.
Figure 23	Pending	Warragamba-222	Niche New Site 2019	Warragamba-222 is an Open Camp Site with artefacts located beside the stored water in Gogongolly Bay, near Gogongolly Creek. There were 11 artefacts recorded as part of this assessment, and of these 6 were made from basalt.
Figure 23	Pending	Warragamba-227	Niche New Site 2019	Warragamba-227 is an Open Camp Site with low-density artefact scatter located south of the Kedumba waterhole. There were five artefacts located during this survey.
Figure 23	Pending	Warragamba-230	Niche New Site 2019	Warragamba-230 is an Open Camp Site with artefacts located on a spur on western side of John Seymour Hill. The landform on which this site is located likely extends to the north towards end of main spur leading east to John Seymour hill. Volcanic and chert material was present in the sample of 6 artefacts recorded as part of this survey.
Figure 23	Pending	Warragamba-231	Niche New Site 2019	Warragamba-231 is an Open Camp Site with artefacts located South West of John Seymour Hill. There were four artefacts located as part of this survey.
Figure 23	Pending	Warragamba-232	Niche New Site 2019	Warragamba-232 is an Open Camp Site with an extensive artefact scatter located on Spur running South West to Alum Springs Creek. A sample of 10 artefacts was recorded during this survey.
Figure 23	Pending	Warragamba-235	Niche New Site 2019	Warragamba-235 is an Open Camp Site with artefacts located on creek terrace – Alum Springs Creek, in tall forest. There were four artefacts located in this survey including an axe and large basalt cores.
Figure 23	Pending	Warragamba-237	Niche New Site 2019	Warragamba-237 is an Open Camp Site with artefacts located south of the junction of Cox's River and Horse Arm Creek. There were ten artefacts located during this survey.
Figure 23	Pending	Warragamba-241	Niche New Site 2019	Warragamba-241 is an Open Camp Site with artefacts located on the bank of the Cox's River, to the South of John Seymour Hill. There were five artefacts located during this survey.
Figure 23	Pending	Warragamba-242	Niche New Site 2019	Warragamba-242 is an Open Camp Site with artefacts located on the bank of the Cox's River, to the South of John Seymour Hill, Warragamba-242. There were three artefacts located during this survey.
Figure 23	Pending	Warragamba-244	Niche New Site 2019	Warragamba-244 is an Open Camp Site located on the eastern bank of the Cox River, south of Warragamba-243. There were four artefacts located as part of this survey.
Figure 23	Pending	Warragamba-245	Niche New Site 2019	Warragamba-245 is an Open Camp Site located on the eastern bank of the Cox River, south of Warragamba-244. There were two artefacts located as part of this survey.
Figure 23	Pending	Warragamba-247	Niche New Site 2019	Warragamba-247 is an Open Camp Site with artefacts located on a spur north of the junction of Horse Arm Creek and the Cox River, and across the River from Warragamba-230. The artefact sample recorded during this survey contained a mixture of flakes, cores, and a ground head axe, and were made from chert and volcanic stone. There were twelve artefacts recorded.
Figure 23	Pending	Warragamba-248	Niche New Site 2019	Warragamba-248 is an Open Camp Site with artefacts located south of the junction of Horse Arm Creek and the Cox River. To the south of this site Warragamba-249 is located, also beside the stored water, with Warragamba-237 located to the north. A sample of 2 artefacts was recorded during this survey.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-249	Niche New Site 2019	Warragamba-249 is an Open Camp Site with artefacts located on a spur beside the stored water of the Cox River, and south of Warragamba-248. A sample of nine artefacts was located during this survey.
Figure 23	Pending	Warragamba-250	Niche New Site 2019	Warragamba-250 is an Open Camp Site with artefacts located beside the stored water of the Cox River, and south of Warragamba-248. There were ten artefacts located during this survey, including cores, flakes and an axe made from volcanic, chert and quartz material.
Figure 23	Pending	Warragamba-251	Niche New Site 2019	Warragamba-251 is an Open Camp Site with artefacts located south of Warragamba-250, beside the stored water of the Cox River. There were two artefacts located during this survey.
Figure 23	Pending	Warragamba-252	Niche New Site 2019	Warragamba-252 is an Open Camp Site with artefacts located south of Warragamba-251, beside the stored water of the Cox River. There were six artefacts located during this survey, including some made from basalt and crystalline quartz.
Figure 23	Pending	Warragamba-253	Niche New Site 2019	Warragamba-253 is an Open Camp Site with artefacts located beside the stored water at the confluence of the Cox River and an unnamed tributary, and south of Warragamba-252. Three Hills: Commodores, Grundys and Moody's Hills surround the spur on which the site is located. A sample of twenty-two artefacts were recorded during this survey.
Figure 23	Pending	Warragamba-256	Niche New Site 2019	Warragamba-256 is an Open Camp Site with artefacts located across the unnamed tributary of the Cox River from Warragamba-253, which is north of this site. There were five artefacts located as part of this survey, comprised of quartz, chert and basalt cores and flakes.
Figure 23	Pending	Warragamba-262	Niche New Site 2019	Warragamba-262 is an Open Camp Site with artefacts located beside the stored water of the Cox River, and south of Warragamba-259. There were five artefacts located during this survey, including quartz flakes and a basalt core.
Figure 23	Pending	Warragamba-263	Niche New Site 2019	Warragamba-263 is an Open Camp Site with artefacts located south of Warragamba-262 beside the stored water of the Cox River, with Warragamba-264 to the south. There were seven artefacts recorded during this survey, including basalt flakes and cores, with some chert artefacts as well.
Figure 23	Pending	Warragamba-264	Niche New Site 2019	Warragamba-264 is an Open Camp Site with artefacts located south of Warragamba-263 beside the stored water of the Cox River. There was a sample of fourteen artefacts recorded during this survey, including flakes made from quartz and a basalt axe.
Figure 23	Pending	Warragamba-265	Niche New Site 2019	Warragamba-265 is an Open Camp Site with artefacts located beside the stored water of the Cox River, and between Warragamba-264 to the north, and Warragamba-266 to the south. There were six artefacts located during this survey, including several made from basalt.
Figure 23	Pending	Warragamba-266	Niche New Site 2019	Warragamba-266 is an Open Camp Site with artefacts located south of Warragamba-265 beside the stored water of the Cox River. There were five artefacts located during this survey, including several made from basalt.
Figure 23	Pending	Warragamba-268	Niche New Site 2019	Warragamba-268 is an Open Camp Site with artefacts located on a spur on a spur at the junction of Oaky Creek and the Cox River. Warragamba-269 is located further to the southwest, with eight artefacts located during this survey. These included basalt cores and some quartz cores and flakes.
Figure 23	Pending	Warragamba-302	Niche New Site 2019	Warragamba-302 is an Open Camp Site. The site is located on a spur overlooking the Cox River by Oaky Creek. The spur is adjacent to the stored water. There were three artefacts found, including a flake and cores of chert and Hornfels.
Figure 23	Pending	Warragamba-303	Niche New Site 2019	Warragamba-303 is an Open Camp Site. The site is located at the Full Supply Level on a spur at the junction of Oaky Creek and the Cox River. There were five artefacts found at the site.
Records of Open Camp Sites with Axe Grinding Grooves				

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-267	Niche New Site 2019	Warragamba-267 is an Open Camp Site with Artefact Scatter and Axe Grinding Grooves located beside the Cox River at the junction with the Oaky Creek. There was a sample of sixteen artefacts found as part of this survey, with a selection of basalt, chert and quartz cores and flakes. There were 11 grooves located on a boulder within the stored water at Full Supply Levels of Warragamba Dam.
Records of Open Camp Sites with Axe Grinding Grooves and Isolated Artefact				
Figure 23	Pending	Warragamba-191	Niche New Site 2019	Warragamba-191 is an Open Camp Site with Axe Grinding Grooves and Isolated Artefact located on the point formed by the union of Ripple Creek and Warragamba River. There were two Grooves located and a single chert flake found as part of this survey.
Records of Open Camp Sites with Scarred Tree				
Figure 23	Pending	Warragamba-151	Niche New Site 2018	Warragamba – 151 is an Open Camp Site with artefacts and a possible Scarred Tree. It is located beside the stored water on a lower slope, in a northerly direction along the shoreline from Warragamba – 150.
Figure 23	Pending	Warragamba-168	Niche New Site 2018	Warragamba – 168 is an Open Camp Site with Scarred Tree located on the southern side of Irish Bay, alongside the stored water. Warragamba – 169 is located across the unnamed dry creek to the west. There were 4 artefacts located during this survey, and the Scarred Tree is located on the western border of the landform, near the dry creek channel mentioned above.
Figure 23	Pending	Warragamba-196	Niche New Site 2019	Warragamba-196 is an Open Camp Site with Scarred Tree located beside the stored water near Bimlow Point, north of an unnamed tributary of Lacy's Creek and Warragamba-195. An Ironbark scarred tree was identified on this site, as well as a Quartz flake and a basalt single platform core.
Figure 23	Pending	Warragamba-218	Niche New Site 2019	Warragamba-218 is an Open Camp Site with Scarred Tree located beside the stored water on the southern side of Bellbird Point. There were 12 artefacts located as part of this assessment, and these included a high percentage of basalt types.
Figure 23	Pending	Warragamba-220	Niche New Site 2019	Warragamba-220 is an Open Camp Site with Scarred Trees located beside the stored water 820m south of Junction Point. There was a deposit of Morle-Boc located at the site. There were 11 artefacts recorded during this survey, including several made from basalt.

Table 31: Summary of Open Camp Sites within the PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Open Camp Sites				
Figure 8, Figure 20	45-4-0967	RC1	AHIMS Site Card	RC1 is an Open Camp Site located in a bight of Butchers Creek. 5 artefacts were re-located during this survey.
Figure 7, Figure 19	52-1-0128	Little River 3	AHIMS site card- H. Brayshaw 1989	This site is an Open Camp Site located on the hill slope of a ridgeline near a flat spur, positioned above Little River. The area is surrounded by tall ironbark eucalypts and wattles and the local rock type consists of Permian shales, silt, and clays. The site has maintained good integrity from the initial survey undertaken by Brayshaw 1989. Despite the area being cleared for farming (as noted in the original site card 1989), evidence of new-growth and regrowth is visible within the landscape directly surrounding this site. This site spans an area of approximately 200m in width and 200m in length across the ridgeline.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-00	Niche New Site 2018	This site is an Open Camp Site located on a river terrace close to a creek and an unnamed drainage line. The landscape surrounding the area is surrounded by tall trees of various species and signs of new growth is evident in the area, most probably from past clearing of the old vegetation.
Figure 22, Figure 23	Pending	Warragamba-32	Niche New Site 2018	This Open Camp Site is located along a level section of the spur and extends down towards the access track. The site comprises of a low-density scatter that measures 200 m x 40 m. During this assessment three sample artefacts were recorded.
Figure 22, Figure 23	Pending	Warragamba-52	Niche New Site 2018	This Open Camp Site is 40 m west of the access road. The site comprises of two stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-54	Niche New Site 2018	This Open Camp Site is 40 m west of the access road. The site comprises of three stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-65	Niche New Site 2018	This Open Camp Site is just west of Warragamba 64, on a flat of Murphy's Gully. The site comprises of seven stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-72	Niche New Site 2018	This Open Camp Site is located just off the Wollondilly River. The site comprises of six stone artefacts and has potential for subsurface deposits. The area has been heavily disturbed by wombat burrowing.
Figure 22, Figure 23	Pending	Warragamba-93	Niche New Site 2018	Warragamba 93 is an Open Camp Site off Tonalli Cove. It is comprised of 4 artefacts.
Figure 22, Figure 23	Pending	Warragamba-98	Niche New Site 2018	This Open Camp Site is located on the Tonalli River. The site comprises of three stone artefacts
Figure 22, Figure 23	Pending	Warragamba-110	Niche New Site 2018	Warragamba 110 is an Open Camp Site extending 100 m x 100 m. A sample of 14 artefacts were recorded for the purpose of this assessment.
Figure 22, Figure 23	Pending	Warragamba-138	Niche New Site 2018	Warragamba 138 is an open camp site with artefacts located on a terrace near the junction of Rocky Creek with Butchers Creek. Two artefacts were located at this site.
Figure 22, Figure 23	Pending	Warragamba-139	Niche New Site 2018	Warragamba 139 is an open camp site with artefacts located on a ridge adjacent to Butchers Creek. Five artefacts were located at this site.
Figure 22, Figure 23	Pending	Warragamba-148	Niche New Site 2018	Warragamba – 148 is an Open Camp Site, containing artefacts which were eroding down the slope. This site is located on the lower slope of Houlouhan point, 20m from the stored water, and shares a landform with Warragamba – 149.
Figure 22, Figure 23	Pending	Warragamba-150	Niche New Site 2018	Warragamba – 150 is an Open Camp Site with artefacts located on the lower slope beside the stored water. This site contains a different raw material type compared to the other side of the stored water.
Figure 22, Figure 23	Pending	Warragamba-154	Niche New Site 2018	Warragamba – 154 is an Open Camp Site with artefact scatter located north of Warragamba – 153 along the impact corridor beside the stored water. As is typical of these sites, artefacts found are most likely eroded from further up the slope.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-158	Niche New Site 2018	Warragamba – 158 is an Open Camp Site with artefacts located beside the stored water, north of an unnamed creek. It consists of 6 stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-159	Niche New Site 2018	Warragamba – 159 is an Open Camp Site with artefacts located north and further along the waterline from Warragamba – 158. The landform is bounded to the north and south by unnamed creek lines.
Figure 22, Figure 23	Pending	Warragamba-161	Niche New Site 2018	Warragamba – 161 is an Open Camp Site with artefacts located on a flat area or 'bench' on lower slope of a ridgeline overlooking the stored water. This site is close to the large rock fall caused by the collapse of a section of the major cliff line which forms the sides of the valley in which the site is located. The artefact scatter is of low density.
Figure 22, Figure 23	Pending	Warragamba-163	Niche New Site 2018	Warragamba – 163 is an Open Camp Site located 210m North West of Warragamba – 162 alongside the stored water. There were 8 artefacts located during this survey.
Figure 23	Pending	Warragamba-197	Niche New Site 2019	Warragamba-197 is an Open Camp Site located beside the stored water north of Warragamba-196 and Bimlow Point. There were three artefacts found during this assessment, including a basalt blank.
Figure 23	Pending	Warragamba-229	Niche New Site 2019	Warragamba-229 is an Open Camp Site with possible quartz artefacts located on edge of FSL, to the South West of Policeman Point. There was no artefact recording completed for this site.
Figure 23	Pending	Warragamba-271	Niche New Site 2019	Warragamba-271 is an Open Camp Site located on a long flat ridge on a bend in Oaky Creek, a tributary of the Cox River, and within 50m of this water source. There was several chert and quartz artefacts observed, and a basalt axe was recorded as part of this survey.

Table 32: Summary of Open Camp Sites outside the PUIA and EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Open Camp Sites				
Figure 8, Figure 20	45-4-0187	Kedumba; Kedumba Crossing	AHIMS Site Card	This site is an Open Camp Site with artefacts located near the Kedumba River. There were 5 artefacts re-located at the site during this survey.
Figure 8, Figure 20	45-4-0948	GW5	AHIMS Site Card T. Kowder 1998	GW 5 (or Green Wattle Creek 5) is an Open Camp Site with artefacts concentrated in a small area on top of a ridgeline 350m from Green Wattle Creek. At the time of the initial recording in August 1998 by T. Kowder, there were 28 artefacts located, including chert, quartz, and mudstone partial and complete flakes.
Figure 8, Figure 20	45-4-0983	JUNCTION POINT 1	AHIMS Site Card	JUNCTION POINT 1 is an Open Camp Site located on a saddle between two ridge points near Junction point. There were 9 artefacts re-located during this survey.
Figure 7, Figure 19	52-1-0126	Little River 1	AHIMS site card- H. Brayshaw	This site is an Open Camp Site that runs along a dirt track atop a spur, positioned approximately 100m above the Nattai River to the west, and south west of Sheehy's Creek. The site was originally recorded by Brayshaw in 1989 and appears to have fair to good site integrity with some signs of erosions present. Artefacts recorded include raw materials of quartz, mudstone, and chert, with a high possibility of subsurface finds being present.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 7, Figure 19	52-1-0127	Little River 2	AHIMS site card- H. Brayshaw 1989	This is an Open Camp Site located along a previously bulldozed track. Two small chert cores were relocated close to an old track positioned close to Little River directly to the south west and just east of the Nattai River. This site was originally recorded, with limited information by Brayshaw in 1989 and appears to be in a fair and stable condition with a small threat of erosion occurring at the site.
Figure 7, Figure 19	52-1-0133	Tonalli Cove 4	AHIMS site card- H. Brayshaw & M. Dallas 1989	This site is located 220m south west of Tonalli Cove 3, along a vehicle track, on the north western slope of a ridgeline. This site is an Open Camp Site positioned atop a ridgeline over-looking Lake Burragarong 50m to the north. The artefact scatter extends across the entirety of the spur and upper slope of the ridgeline. Multiple artefacts are visible on the surface amongst gravels and include raw materials such as: basalt, chert, and quartzite. This site appears to be in relatively stable and good condition, compared to the original recording undertaken in 1989.
Figure 7, Figure 19	52-1-0346	Joorilands OS-1	AHIMS Site Card	Joorilands OS-1 is an Open Camp Site with artefacts located west of Wollondilly River, 150m from a woolshed. The initial recording of the site was in May 2005, during a terrestrial ecology survey. There were an unknown number of artefacts in a large quantity and a variety of types observed, but not recorded during this initial location of the site.
Figure 7, Figure 19	52-1-0141	Upper Wollondilly 2	AHIMS Site Card	Upper Wollondilly 2 is an Open Camp Site with artefacts which is located on an exposed track alongside the Wollondilly River. There were 12 artefacts re-located during this survey. The original recording of this site was by H. Brayshaw and J. McDonald in March of 1989. There were 51 artefacts located for this initial recording in 1989, not including numerous fragments. These were made of chert, mudstone, silcrete, and quartz, and were a mixture of flakes and cores.
Figure 22, Figure 23	Pending	Warragamba-01	Niche New Site 2018	Warragamba 01 comprises of an Open Camp Site located a top of a flat terrace close to Golden Moon Creek. The site comprises of four flakes made from quartz and quartzite.
Figure 22, Figure 23	Pending	Warragamba-02	Niche New Site 2018	Warragamba 02 is an Open camp Site located on an old track, close to an intermittent drainage channel 20 m east of the Nattai River corridor. The site comprises of three stone artefacts, which are heavily weathered and covered in moss.
Figure 22, Figure 23	Pending	Warragamba-03	Niche New Site 2018	This site is an Open Camp Site located on top of a spur, 10 m above the Nattai River corridor, and approximately 15 m from the Nattai River. The site comprises of three flakes made of chert and quartz.
Figure 22, Figure 23	Pending	Warragamba-06	Niche New Site 2018	Warragamba 06 comprises of an Open Camp Site that is eroding on the broad lower ridge of a cliff line. This cliff line is positioned approximately 10 m above a large waterhole and within proximity of both Little River and Golden Moon Creek. The site comprises of eight stone artefacts made from chert and quartz.
Figure 22, Figure 23	Pending	Warragamba-07	Niche New Site 2018	This is an Open Camp Site located on a spur within proximity of an old road (name unknown) and Little River to the north-west. This site contains two chert artefacts, however the ground visibility at the time of this survey was incredibly poor due to thick vegetation covering most of the ground-surface.
Figure 22, Figure 23	Pending	Warragamba-08	Niche New Site 2018	This Open Camp Site is positioned north east along a spur-top near an old eroded road surface. The site comprises of three stone artefacts comprising of chert and silcrete.
Figure 22, Figure 23	Pending	Warragamba-09	Niche New Site 2018	This Open Camp Site is situated atop a broad lower ridge, 5-10 m directly above Little River. This site may be connected to Warragamba 08 (AHIMS ID pending) however visibility was limited at the time of assessment, so this could not be full determined during this assessment. This site comprises of three stone artefacts made of quartz and chert.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-12	Niche New Site 2018	This Open Camp Site is just north of Warragamba 11 (AHIMS ID# pending). The artefacts are located on the spur of the ridge and are located within the exposure of an old road. The site is approximately 1.3 km from the junction of the Nattai and Little Rivers. The site comprises of eight stone artefacts made of chert and quartz. It is highly likely that there is subsurface deposit associated with this site.
Figure 22, Figure 23	Pending	Warragamba-14	Niche New Site 2018	Warragamba 14 is located on a ridge close to a small unnamed drainage line within 200 m of the Nattai and Little Rivers junction. This site comprises of two area of artefact concentration, with previous disturbance to the site due to farming land clearance practises.
Figure 22, Figure 23	Pending	Warragamba-53	Niche New Site 2018	This Open Camp Site is 40 m west of the access road. The site comprises of three stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-59	Niche New Site 2018	This Open Camp Site is 40 m west of the access road. The site comprises of one stone artefact. The artefact type was not noted during this assessment.
Figure 22, Figure 23	Pending	Warragamba-66	Niche New Site 2018	This Open Camp Site is 190 m west of the access road. The site comprises of six stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-67	Niche New Site 2018	This Open Camp Site is 400 m west of Warragamba 66. The site comprises of five stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-68	Niche New Site 2018	This Open Camp Site runs for 300 m south off the access road. The site comprises of nine stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-69	Niche New Site 2018	This Open Camp Site is located between two drainage lines off the Wollondilly River. The number of artefacts located at this site were not recorded during this assessment.
Figure 22, Figure 23	Pending	Warragamba-70	Niche New Site 2018	This Open Camp Site is located just off an access track. The site comprises of five stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-71	Niche New Site 2018	This Open Camp Site is located just off the Joorilands River. The site comprises of two stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-89	Niche New Site 2018	This Open Camp Site is located just off Byrnes Creek. The site comprises of three stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-97	Niche New Site 2018	This Open Camp Site is located on the ridgeline north east towards the Tonalli River. The artefacts were exposed about 250 m from the edge of Lake Burragorang. The site comprises of three stone artefacts.
Figure 22, Figure 23	Pending	Warragamba-100	Niche New Site 2018	This Open Camp Site is located on the Tonalli River and extends for 200 m. The site is a high concentration of artefacts, a sample of 10 artefacts were recorded as part of this assessment.
Figure 22, Figure 23	Pending	Warragamba-137	Niche New Site 2018	Warragamba 136 is open camp site with artefacts located on a terrace 30m from Kedumba River. Eighteen artefacts were located at this site.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 22, Figure 23	Pending	Warragamba-166	Niche New Site 2018	Warragamba – 166 is an Open Camp Site with low-density artefact scatter located at the distal end of a spur shared by Warragamba – 165, and south east of Irish Bay, alongside the stored water. There were two artefacts located on during this survey.
Figure 22, Figure 23	Pending	Warragamba-172	Niche New Site 2019	Warragamba-172 is an Open Camp Site with artefacts located beside the stored water and 130m south of Broken Rock Point. There were two artefacts located at this site.
Figure 23	Pending	Warragamba-234	Niche New Site 2019	Warragamba-234 is an Open Camp Site with artefacts located at junction of Alum Springs Creek and an unnamed 1st order tributary. There were two artefacts located at this site.
Figure 23	Pending	Warragamba-236	Niche New Site 2019	Warragamba-236 is an Open Camp Site with artefacts located on spur heading north towards lower Horse Arm Creek. There were ten artefacts located during this survey.
Figure 23	Pending	Warragamba-255	Niche New Site 2019	Warragamba-255 is an Open Camp Site with artefacts located on a spur beside an unnamed tributary of the Cox River, east of Warragamba-254 and west of Warragamba-256. A sample of thirteen artefacts was recorded as part of this assessment, and these included flakes and cores made from volcanic materials, as well as chert and fine-grained silicate.
Figure 23	Pending	Warragamba-278	Niche New Site 2019	Warragamba-278 is an Open Camp Site located on a saddle flat, gently sloping to the north, east and south. The site is between the Oaky Creek and the Cox River and Moody's Hill. The surface of the site is shallow and there is evidence of erosion. There was a total of 4 artefacts found which included flakes made from quartz and chert.
Figure 23	Pending	Warragamba-293	Niche New Site 2019	Warragamba-293 is an Open Camp Site located on the northern side of Moody's hill. The site contains a large isolated boulder. There were three artefacts found associated with the boulder.
Records of Open Camp Sites with Axe Grinding Grooves and Isolated Artefact				
Figure 23	Pending	Warragamba-291	Niche New Site 2019	Warragamba-291 is an Open Camp Site with Axe Grinding Grooves and Isolated Artefact located on a level flat above the breakaway edge that forms Warragamba-289. The site has 55 Axe Grinding Grooves in several groupings, many associated with natural depressions in the bedrock. The artefact found was south of the tree line and is a quartz core.
Records of Open Camp Sites with Axe Grinding Grooves and Scarred Tree				
Figure 7	52-1-0170	Joorilands Farm 2	AHIMS Site Card T. Kowder (1997)	This is an Open Camp Site with Axe Grinding Grooves and a Scarred Tree. The original recording for Joorilands Farm 2 was in April 1997 by T. Kowder, and there were 13 artefacts located for this initial recording. There was no mention of a scarred tree on the AHIMS card for this site.
Records of Open Camp Sites with Scarred Tree				
Figure 7	52-1-0168	Joorilands Farm 1	AHIMS Site Cad (1997).	This site is both a scarred tree and Open Camp Site located half a kilometre south of Joorilands Farmhouse, along a dirt track positioned on the southern bank of a small tributary connected to the Wollondilly River. The site is positioned on a gentle, lower mid-slope within an open box gum woodland and open grassland originally used for farming and grazing. The original survey conducted in 1997 recorded this site as a campsite containing many artefacts scattered atop the surface. The recent survey (2018) demonstrated that this artefact scatter was still visible and in a fair to good condition, with the new addition of three scarred trees being identified as part of this previously recorded site. The original site cards did not contain information on the scarred trees and at present they appear to be in a fair to good condition.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-79	Niche New Site 2018	This site comprises of an Open Camp Site and Scarred Tree on the valley flat.
Figure 23	Pending	Warragamba-280	Niche New Site 2019	Warragamba – 280 is an Open Camp Site with Scarred Tree and artefacts located west of the Cox River and mid-slope. The site consists of a levelled saddle north of Warragamba-279. There were 11 artefacts located as part of this survey, including cores and flakes made from chert, quartz, and volcanic material.

9.2.7 Scarred Tree Sites

There were five sites comprised only of Scarred Trees, which were not associated with another feature. All five are located outside of the EUIA and PUIA. Further details and photographs of each registered site is outlined in Table 33, and Annex 1.

Plate 17: General view of scarred Tree at Tonalli Cove 2 (AHIMS ID#52-1-0131)

Plate 18: General view of Scarred Tree at Warragamba-91

Table 33: Summary of Scarred Tree Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Scarred Tree Sites				
Figure 19	52-1-0171	Joorilands Farm 3	AHIMS Site Card T. Kondek (1997)	Joorilands Farm 3 is a Scarred Tree site located 200m south of Joorilands Farm.
Figure 23	Pending	Warragamba-76	Niche New Site 2018	This site comprises of a Scarred Tree, 600m from the stored water along the Wollondilly river valley.
Figure 23	Pending	Warragamba-91	Niche New Site 2018	Warragamba 91 is a Scarred Tree site located East of The Sheepwalk Drive, comprised of 1 Scarred Tree.
Figure 23	Pending	Warragamba-153	Niche New Site 2018	Warragamba – 153 is a scarred tree located mid-slope up from the stored water. There is some indication that it could have had purpose as a marker tree for travelling routes.
Figure 19	52-1-0131	Tonalli Cove 2	AHIMS site Card (1989)	This site is a Scarred Tree and is located south-west of the Wollondilly River, approximately 800m south west of Tonalli Point and a fence line 10m to the east. The tree is positioned on a spur that slopes gently toward the (submerged) Tonalli/Wollondilly River confluence approximately 1.5km to the north east. This scarred tree appears to be a red gum and has been dead for some time and is surrounded by clay and ironstone gravels. This tree is the only old growth species within the local area and is surrounded by a relatively new-growth wooded vegetation. The artefacts originally recorded in 1989, could not be relocated during survey, potentially due to restrictions in ground visibility.

9.2.8 Rockshelter Sites

There are 83 shelter sites identified within the Survey Area. These shelter types comprise of sandstone Shelter with Abrasion Patches, Shelter with Art, Shelter with Art and Deposit, Shelter with Art, Deposit, and Axe Grinding Grooves, Shelter with Deposit, and Shelter with Deposit and Artefacts. A total of eight shelter sites are situated within the PUIA. There are 23 shelter sites located within the EUIA and 52 reside above the PUIA. Further details and photographs of each registered site is outlined in Table 34, Table 35, Table 36, and Annex 1.

Plate 19: General view of Rockshelter found at Warragamba-61

Plate 20: General view of rockshelter formed by an isolated boulder at Bimlow PAD (AHIMS ID#45-4-0997)

Table 34: Summary of Rockshelter Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Shelters with Art and Artefacts				
Figure 23	Pending	Warragamba-16	Niche New Site 2018	This site is a small shelter formed out of sandstone by cavernous weathering and block fall in antiquity. This site comprises of two stacked sandstone boulders sitting atop one another on a lower ridge, very close to the edge of the high-water mark of Lake Burragorang. The lower and larger boulder contains a small overhang that has a heavily eroded narrow panel, and the rock art is located on the shallow roof of this panel. A series of faded and heavily worn horizontal and vertical lines are visible and are of charcoal and yellow/red pigment. A small artefact scatter is evident close to this boulder and included raw materials of quartzite and chert. Due to the proximity of the artefacts in relation to this shelter site, it has been ascertained as being the same site. This site appears to have been subject to water wash and mineralisation from continuous fluctuations in the water levels of Lake Burragorang, and as such is in a very poor state of preservation.
Figure 23	Pending	Warragamba-223	Niche New Site 2019	Warragamba-223 is a Shelter with Art and Artefacts located 96m west of Basin Creek in the vicinity of Warragamba Dam. There were five artefacts located within the dripline during this survey.
Records of Shelter with Art, Artefacts and Axe Grinding Grooves				
Figure 23	45-4-0997	Bimlow PAD	AHIMS Site Card 2004 by A. Dudley	This site is a Shelter with Art, Axe Grinding Grooves and Artefacts located on a point southwest of Hunt Point next to the stored water at Cox River, Warragamba Dam. The shelter is located within the stored water at Full Supply Levels and is formed by an isolated boulder. There is heavy impact from intermittent inundation by the stored water. The art is comprised of red pigment visible on the rear wall of shelter and is very faded. There are multiple grinding groove groupings noticeable on the floor of the shelter, as well as outside on an isolated sandstone platform. There was a total of 43 grinding grooves associated with the shelter. A large artefact scatter is associated with this shelter, and a sample of 25 artefacts were recorded during this assessment. The original recording of this site was undertaken in April 2004 by A. Dudley.
Records of Shelter with Artefacts and Axe Grinding Grooves				
Figure 23	Pending	Warragamba-258	Niche New Site 2019	Warragamba-258 is a Shelter with Artefacts and Axe Grinding Grooves located beside the stored water of the Cox River and is associated with Warragamba-257 to the west, Warragamba-260 to the southeast, and Warragamba 259 to the south. This shelter is formed from an isolated boulder and is located partially within the stored water at Full Supply Levels. There is mineral formation and weathering patterns evident from the rock surfaces which experience immersion by the stored water, and there is no deposit due to erosion from this process. A large scatter of artefacts is visible at the site, out of which a sample of thirty-eight was recorded. There was also three axe grinding grooves located during this survey.
Records of Shelter with Deposit and Art				
Figure 23	Pending	Warragamba-300	Niche New Site 2019	Warragamba-300 is a Shelter with Deposit and Art. The shelter is located on the south side of Werriberri Creek, 60m east of Warragamba-298 and Warragamba-299. The ceiling of the shelter is high and there is a silty deposit consisting of modern alcohol bottles, rope, and debris. The art consists of modern graffiti on and beside the rock art. There were no artefacts found.
Records of Shelter with Deposit				
Figure 23	Pending	Warragamba-192	Niche New Site 2019	Warragamba-192 is a Shelter with Deposit located at the base of a ridgeline beside Ripple Creek. The shelter was formed by cavernous weathering and has evidence of exfoliation on back wall and ceiling, block fall on roof, and is subject from water weathering from the stored water, which inundates the site. There is a yellow sandy deposit, but no artefacts were located during this survey.
Records of Shelter with Deposit and Artefacts				

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-55	Niche New Site 2018	Warragamba 55 comprises of a sandstone shelter with deposit. The shelter is weathering out of a continuous ridgeline. Four artefacts were relocated within the dripline of the shelter.
Figure 23	Pending	Warragamba-84	Niche New Site 2018	Warragamba 84 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of a ridgeline. The artefacts within this shelter are located within the floor deposit.
Figure 23	Pending	Warragamba-200	Niche New Site 2019	Warragamba-200 is a Shelter with Deposit and Artefacts located directly north of Warragamba-199, beside the stored water at Lake Burragorang. The shelter was formed by an isolated boulder and shows evidence of water damage from stored water inundation, as well as block fall. There was a yellow sandy deposit in the floor of the shelter, and a sample of 20 artefacts was in the shelter and the eroding surface of the surrounding landscape. Evidence of fissuring was also recorded on the roof of the shelter.
Figure 23	Pending	Warragamba-206	Niche New Site 2019	Warragamba-206 is a Shelter with Deposit and Artefacts located beside the stored water in the vicinity of sites Warragamba-207 and Warragamba-208. The shelter was formed by cavernous weathering, and it is impacted by the stored water at times when the reservoir is at Full Supply Level. There is evidence of active block fall from the roof of the shelter, as well as fissuring on the back wall. There is also honey combing, chemical weathering on the back wall and roof, and exfoliation on the shelter's roof and floor. Two basalt artefacts were found in the shelter's dripline.
Figure 23	Pending	Warragamba-208	Niche New Site 2019	Warragamba-208 is a Shelter with Deposit and Artefacts located beside the stored water in Butcher's Creek, and directly southwest of Warragamba-207. The shelter was formed by cavernous weathering and is impacted periodically by the stored water at Full Supply Level. There is evidence of chemical weathering and the deposit is eroding down slope. There were two artefacts found at this site, one of which was a Basalt Axe.
Figure 23	Pending	Warragamba-225	Niche New Site 2019	Warragamba-225 is a Shelter with Deposit and Artefacts a located 340m North West of Warragamba-225, alongside the stored water. There were three artefacts located during this survey.
Figure 23	Pending	Warragamba-246	Niche New Site 2019	Warragamba-246 is a Shelter with Deposit and Artefacts located on the Eastern Bank of the Cox River, immediately south of Warragamba-245. There were six artefacts located as part of this survey.
Figure 23	Pending	Warragamba-301	Niche New Site 2019	Warragamba-301 is a Shelter with Deposit and Artefacts. The shelter is located near Warragamba-300 at Werriberri Creek. The shelter is near the stored water. There were eleven artefacts recorded as part of this survey.
Records of Shelter with Deposit, and Axe Grinding Grooves				
Figure 23	Pending	Warrabamba-207	Niche New Site 2019	Warragamba-207 is a Shelter with Axe Grinding Grooves and Deposit located directly east of Warragamba-206, beside the stored water of Butcher's Creek. The shelter was formed by Cavernous weathering and is heavily impacted by water wash from the stored water periodically inundating the site. There is also evidence of honeycombing, chemical weathering and fissuring on the roof and back wall of the shelter. The five Axe Grinding Grooves are located on a boulder in the dripline at the southern end of the shelter.
Records of Shelter with Deposit and Isolated Artefact				
Figure 23	Pending	Warragamba-239	Niche New Site 2019	Warragamba-239 is a Shelter with Deposit and Isolated Artefact located beside the stored water on the South side of Warragamba Gorge, north along the unnamed tributary of the Warragamba River from Warragamba-238. A single flake was located at this site.
Records of Shelter with Deposit, Art, and Artefacts				
Figure 23	Pending	Warragamba-182	Niche New Site 2019	Warragamba-182 is a Shelter with Art, Deposit and Artefacts that is located 50m east of an unnamed tributary of Ripple Creek. The shelter was formed by cavernous weathering and block fall and shows evidence of exfoliation, fissuring and block fall. There were eight motifs recorded at this shelter, with one humanoid figure and several motifs consisting of lines and is in poor condition. There were five artefacts located as part of this survey.
Figure 23	Pending	Warragamba-211	Niche New Site 2019	Warragamba-211 is a Shelter with Art, Deposit and Artefacts located beside the stored water along the Wollondilly River, south of Blattmann Point and north of Warragamba-210. The shelter was formed by an isolated boulder and is impacted by flooding periodically from the stored water level. There is also evidence of fissuring and exfoliation on the roof and black fall and chemical

Figure Reference	AHIMS ID	Site Name	Recorded	Description
				weathering also impacts the site. The art present is three parallel red linear vertical lines and the art surface is in poor condition. Out of the several thousand artefacts potentially at the site, as sample of 15 were recorded during this assessment. Several volcanic artefacts were present as part of this sample.
Figure 23	Pending	Warragamba-145	Niche New Site 2018	Warragamba 145 is a shelter with deposit, art and associated artefacts, 11 were located. The shelter contains deposits of Morle-Boc which, being alkaline instead of acidic in nature, are associated with healing properties. This information in addition to the artefact collection seems to indicate a medical use for the site.
Records of Shelter with Deposit, Artefacts and Axe Grinding Grooves				
Figure 23	Pending	Warragamba-305	Niche New Site 2019	Warragamba-305 is a Shelter with Deposit, Artefacts and Axe Grinding Grooves. The shelter is located on the northern upper slope of the ridgeline above Oaky Creek. There was a single grinding groove was found on the north-east edge of the shelter floor. There were three artefacts found on the drip line and apron of the shelter.
Records of Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks				
Figure 23	Pending	Warragamba-259	Niche New Site 2019	Warragamba-259 is a Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks located beside the stored water of the Cox River, and south of Warragamba-258 and Warragamba-260. The shelter is formed by an Isolated Boulder and is periodically inundated by the stored water at Full Supply Levels. A large quantity of artefacts was visible in the sandy deposit, with a sample of twelve recorded as part of this survey. There were three axe grinding grooves located, and additionally 7 negative flake scars on the back panel of the shelter, from which flakes had been removed. This rock formation shows signs of fissuring, chemical weathering, micro and macro vegetal growth, and disturbance by wombats.
Records of Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact				
Figure 23	Pending	Warragamba-219	Niche New Site 2019	Warragamba-219 is a Shelter with Axe Grinding Grooves, Deposit and Isolated Artefact located beside the stored water on the northern side of Bellbird Point. The shelter was formed by an isolated boulder and is periodically inundated by the stored water at Full Supply Level. There is evidence of cavernous weathering, block fall, exfoliation, and spalling. Of the two abrasion patches, one is located inside the shelter, and the other on a sandstone boulder to the north.
Records of Shelter with Isolated Artefact				
Figure 23	Pending	Warragamba-260	Niche New site 2019	Warragamba-260 is a Shelter with Isolated Artefact located within the region occupied by the stored water of the Cox River at Full Supply Levels and is situated between Warragamba-258 and Warragamba-259. The shelter showed evidence of impact by periodic submersion by the stored water, with algal growth, chemical weathering, and lack of a deposit effects of this process. There was a single volcanic flake found during this survey.

Table 35: Summary of Rockshelter Sites within the PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Shelters with Art				
Figure 23	Pending	Warragamba-193	Niche New Site 2019	Warragamba-193 is a Shelter with Art located alongside Ripple Creek, at the base of the ridgeline. The shelter was formed by cavernous weathering and has evidence of fissuring on the back wall, block fall, chemical weathering, and exfoliation on the roof. The art surfaces are in very poor condition, and the art is barely visible. These motifs are multiple black pigment lines located on the back wall.
Records of Shelter with Deposit				

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-187	Niche New Site 2019	Warragamba-187 is a Shelter with Deposit located on a creek bank beside the stored water in Lacy's Creek. The shelter is formed by an isolated boulder, and shows signs of chemical weathering, water wash and salt and granular loss. There is a yellow sandy deposit located in the shelter.
Records of Shelter with Deposit and Artefacts				
Figure 23	Pending	Warragamba-104	Niche New Site 2018	Warragamba 104 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of the ridgeline. The artefacts within this shelter are located within the floor deposit.
Figure 23	Pending	Warragamba-132	Niche New Site 2018	Warragamba 132 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of the ridgeline. The artefacts (100+) within this shelter are located within the floor deposit, a sample of 14 were recorded for this assessment.
Figure 23	Pending	Warragamba-149	Niche New Site 2018	Warragamba – 149 is a shelter with deposit containing artefacts, located on mid-slope above Houlouhan point, 50m from the stored water, and shares this landform with Warragamba – 148. This shelter has two level floors, separated by block fall and soil eroding down the slope. There is no art surface visible, and the rock displays a high degree of water wash.
Figure 23	Pending	Warragamba-299	Niche New Site 2019	Warragamba-299 is a Shelter with Deposit and Artefacts. The shelter is located just above the high watermark in a sandstone formation at Werriberri Creek. The interior of the shelter consists of a deposit that is flat-gently sloped with an elongated floor. There were artefacts present but not recorded for this site.
Records of Shelter with Deposit, Artefacts and Axe Grinding Grooves				
Figure 23	45-4-0186	Policeman's Point	AHIMS site card Brayshaw (1981)	This site contains three areas: An Open Camp Site, two rockshelters (shelter A & shelter B) and Axe grinding grooves. The open site is located on the lower spur of a ridge atop an unsealed vehicle track, 50 metres south of a small creek opposite Policeman's point. This artefacts scatter is approximately 1km southeast of the Kedumba/Cox River approximately 100 metres west of rockshelter A and rockshelter B. Material types include: chert, mudstone, and quartz
Records of Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact				
Figure 23	Pending	Warragamba-298	Niche New Site 2019	Warragamba-298 is a Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact. The shelter is located just above the Full Supply Level, on the south-side of Werriberri Creek. There was a single abrasion patch on a rock in the west end of the shelter. The quartzite isolated artefact was in the middle of the shelter.

Table 36: Summary of Rockshelter Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Shelter with Art				
Figure 23	Pending	Warragamba-144	Niche New Site 2019	Warragamba 144 is a Shelter with Art located 100m from Warragamba 143 on the Cox Riverbank. The shelter is part of a continuous ridgeline and was formed by cavernous weathering. The art is in poor condition and consists of lines of indeterminate form.
Figure 23	Pending	Warragamba-279	Niche New Site 2019	Warragamba-279 is a Shelter with Art formed by an angled boulder on mid-slope on the same hill as Warragamba-277. The art consists of a charcoal motif of indeterminate form. The art is about 85cm above the floor on the western side of the boulder.
Records of Shelter with Art and Axe Grinding Grooves				

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-274	Niche New Site 2019	Warragamba-274 is a Shelter with Art and Axe Grinding Grooves running across a continuous ridgeline located across from Warragamba-278 and 277. Due to the terrain type there a lack of floor to this shelter. There is one panel of art in poor condition and exfoliating naturally. Warragamba-274 also contains four grinding grooves associated with two abrasion patches.
Figure 23	Pending	Warragamba-275	Niche New Site 2019	Warragamba-275 is a Shelter with Art and Axe Grinding Grooves. The site itself is formed by an isolated boulder near the junction of Oaky Creek and the Cox River. There is an abrasion patch found on the eastern side of the boulder. The boulder is on the lower slopes of the ridge and is beside the stored water at 150m. There is also art present which consists of a clay handprint and a semi-circular arc of orange/red pigment.
Figure 23	Pending	Warragamba-285	Niche New Site 2019	Warragamba-285 is a Shelter with Art and Axe Grinding Grooves. The shelter is located on the northern section the sandstone ridgeline containing Warragamba-284. There were eight grinding grooves found in the shelter. The shelter was formed by an isolated boulder located above a 45° slope. The art is in good to poor condition and consists of 10 motifs, containing zoomorphic and anthropomorphic figures, as well as geometric lines and hand stencils.
Records of Shelter with Art, Artefacts and Axe Grinding Grooves				
Figure 23	Pending	Warragamba-281	Niche New Site 2019	Warragamba-281 is a Shelter with Art, Artefacts and Axe Grinding Grooves. The shelter is located near the crest of the ridgeline containing Warragamba-272. There is an apron of uneven sandstone bedrock outside the site. The art is faded but in good condition (visible). The site also contains 1 grinding groove and 9 artefacts, which contain a mixture of flake made from chert and quartz, with one made from basalt.
Records of Shelter with Axe Grinding Grooves				
Figure 23	Pending	Warragamba-257	Niche New Site 2019	Warragamba-257 is a Shelter with Axe Grinding Grooves located mid-slope beside the stored water of the Cox River and is west up the slope from Warragamba-258. The shelter was formed from an isolated boulder, and is experiencing fissuring, chemical weathering, block fall, and honeycombing, with evidence of disturbance from wombats. There were three abrasion patches with groves located during this survey.
Records of Shelter with Deposit and Art				
Figure 23	Pending	Warragamba-60	Niche New Site 2018	Warragamba 60 comprises of a sandstone shelter, located at the top ridgeline above the Wollondilly River. The site is a Shelter with Art and Deposit and faces north. There were six artefacts relocated washed down the slope towards the river just outside of the shelter. The art consists of a charcoal zig zag line on the shelters ceiling.
Figure 23	52-1-0142	Kamilaroi Point	AHIMS Site Card Brayshaw (1989)	The site is located on a north west facing spur, some 600m above the Wollondilly River (now submerged by Lake Burragorang) approximately 10m north west of a road cutting. The site is surrounded by a woodland, dominated by tea tree, grey gums and low-lying shrubby vegetation. The site is a large boulder formed from Narrabeen sandstone that has a small overhang facing south containing an alluvial floor deposit that slopes towards the northwest. Many artefacts are located within the floor of the shelter and very faded rock art (both red and white pigment) is visible on the main panel of the boulders northern wall.
Records of Shelter with Deposit				
Figure 23	52-1-0178	MF1	AHIMS site card-Tokomak (07/11/1997)	MF 1 comprises of a small shelter that faces north and is located below the top of an escarpment just above a Talus Slope and is directly surrounded by species of casuarina and paperbark trees. The shelter comprises of a very wind-eroded sandstone hollow containing a shallow sandy loam floor deposit varying from 10-15cm.
Figure 23	Pending	Warragamba-10	Niche New Site 2018	Warragamba 10 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on a small crest of a ridgeline. The artefacts within this shelter are located along the drip line.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-11	Niche New Site 2018	Warragamba 11 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on a small crest of a ridgeline. The artefacts within this shelter are located 6 m to the north of the shelter, as a result both areas are recorded as one site.
Figure 23	Pending	Warragamba-136	Niche New Site 2018	Warragamba – 136 is a shelter with deposit with a high potential to contain cultural material. This shelter is affected by fissuring, block fall and exfoliation on the back wall. Evidence of wombats was present on the site.
Records of Shelter with Deposit and Artefacts				
Figure 23	Pending	Warragamba-31	Niche New Site 2018	Warragamba 31 comprises of a sandstone shelter with deposit. The shelter consists of an eroding boulder within an isolated setting. Three artefacts were relocated within the dripline of the shelter.
Figure 23	Pending	Warragamba-46	Niche New Site 2018	Warragamba 46 comprises a weathering sandstone boulder shelter and deposit was observed toward the back of the shelter within an isolated setting. Three artefacts were relocated within the dripline of the shelter.
Figure 23	Pending	Warragamba-56	Niche New Site 2018	Warragamba 56 comprises of a sandstone shelter with deposit. The shelter is weathering out of a continuous ridgeline. Four artefacts were relocated within the dripline of the shelter.
Figure 23	Pending	Warragamba-57	Niche New Site 2018	Warragamba 57 comprises of a sandstone shelter with deposit. The shelter is weathering out of a continuous ridgeline. The deposit has been heavily disturbed by a wombat burrowing. Two artefacts were relocated within the dripline of the shelter.
Figure 23	Pending	Warragamba-58	Niche New Site 2018	Warragamba 58 comprises of a sandstone shelter with deposit. The shelter is weathering out of a continuous ridgeline. The deposit has been heavily disturbed by a wombat burrowing. One artefact was relocated within the floor of the shelter. The artefact details were not recorded during this assessment.
Figure 23	Pending	Warragamba-112	Niche New Site 2018	Warragamba 112 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of a ridgeline. Three artefacts within this shelter are located within the floor deposit.
Figure 23	Pending	Warragamba-165	Niche New Site 2018	Warragamba – 165 is a shelter with deposit located on a bench on the lower slopes of a ridgeline, the shelter is within 50m of the stored water. Warragamba – 166 extends north to the end of the point on which this site is located. There was an archaeological deposit located at this shelter and 11 artefacts were located, mostly at the shelter's dripline.
Figure 23	Pending	Warragamba-238	Niche New Site 2019	Warragamba-238 is a Shelter with Deposit and Artefacts located beside the stored water on the South side of Warragamba Gorge, next to an unnamed tributary of the Warragamba River. There were three artefacts located at this site.
Figure 23	Pending	Warragamba-294	Niche New Site 2019	Warragamba-294 is a Shelter with Deposit and Artefacts. The shelter is located mid-slope just below Warragamba- 293. There were four artefacts found outside the shelter.
Figure 23	Pending	Warragamba-297	Niche New Site 2019	Warragamba-297 is a Shelter with Deposit and Artefacts. The shelter is located beside the stored water at Werriberri Creek. The shelter is long and contains an extensive hearth in the central-southern part. The inside of the shelter is scattered with fallen boulder debris from the ceiling. There were six artefacts found in the southern section of the shelter.
Figure 23	Pending	Warragamba-306	Niche New Site 2019	Warragamba-306 is a Shelter with Deposit and Artefacts. The shelter is located on the southern slope above Oaky Creek in a sandstone formation. There were six artefacts found along the drip line.
Records of Shelter with Deposit and Isolated Artefact				
Figure 23	Pending	Warragamba-224	Niche New Site 2019	Warragamba-224 is a Shelter with Deposit and Isolated Artefact located 1.5km West South West from the junction of the Cox and Kedumba Rivers. The artefact located during this survey was a green chert flake. The art consisted of indeterminates
Records of Shelter with Deposit, and Axe Grinding Grooves				
Figure 23	Pending	Warrabamba-135	Niche New Site 2018	Warragamba 135 is a shelter with grinding grooves situated mid-slope of a gully formed by an unnamed creek.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-272	Niche New Site 2019	Warragamba – 272 is a Shelter with Axe Grinding Grooves, located 300m from the stored water of the Cox River. The Shelter was formed by cavernous weathering and exhibits evidence of fissuring, spalling/exfoliation, and granular loss. There is a grinding patch located 1.2m from the northern end of the shelter.
Figure 23	Pending	Warragamba-273	Niche New Site 2019	Warragamba-273 is a Shelter with Deposit and Axe Grinding Grooves, located beside the stored water of the Cox River, and south of Warragabma-272. The Shelter is formed by cavernous weathering and block fall and exhibits evidence of Spalling, exfoliation, and fissuring. There are two vertical abrasion patches at the northern end of the shelter. The two vertical abrasions are about 1.3m from the floor.
Figure 23	Pending	Warragamba-283	Niche New Site 2019	Warragamba-283 is a Shelter with Deposit and Axe Grinding Grooves. The shelter is located near the top of the ridgeline associated with Warragabma-281. The abrasion patch is located on a sandstone boulder broken away from the ridgeline on the east-facing side of the shelter. The shelter faces east looking over the Cox River.
Figure 23	Pending	Warragamba-284	Niche New Site 2019	Warragamba-284 is a Shelter with Deposit and Axe Grinding Grooves. The shelter is located along a ridgeline situated north of Warragamba-280. On the left side of the shelter is a cavity containing silty deposit which has a greater depth than 400mm. There were no visible artefacts found associated with the deposit. There were four grinding grooves found near each other.
Figure 23	Pending	Warragamba-286	Niche New Site 2019	Warragamba-286 is a Shelter with Deposit and Axe Grinding Grooves. The shelter was formed by an isolated boulder near the crest of the ridgeline containing Warragamba-285. There is a minimal deposit made up of fallen sandstone grains. There are two grinding grooves against the south facing wall of the shelter. There is another abraded area on the east-facing corner of the same rock.
Records of Shelter with Deposit, Art, and Artefacts				
Figure 23	Pending	Warragamba-61	Niche New Site 2018	Warragamba 61 comprises of a sandstone shelter, located at the top ridgeline above the Wollondilly River. The site is located approximately 290 m west of Warragamba 60, and is a Shelter with Art and Deposit that faces west. There were four stone artefacts found to be eroding out of the shelter floor, the art comprises of indeterminate lines in both red and white ochre.
Figure 23	Pending	Warragamba-62	Niche New Site 2018	Warragamba 62 comprises of a sandstone shelter formed through cavernous weathering, located at the top ridgeline above the Wollondilly River. The site is located approximately 318 m west of Warragamba 61, and is a Shelter with Art and Deposit that faces west. There were two stone artefacts found to be eroding out of the shelter floor, the art comprises of two charcoal anthromorphs and four other indeterminate lines.
Figure 23	Pending	Warragamba-115	Niche New Site 2018	Warragamba 115 comprises of a sandstone shelter, located at the mid slope of the ridgeline above the Cox River. The site is a Shelter with Art and Deposit and faces north west. There were eight artefacts located within the shelter floor. The art is in poor condition and is scratched within the art panel.
Figure 23	Pending	Warragamba-209	Niche New Site 2019	Warragamba-209 is a Shelter with Art, Deposit and Artefacts located beside the stored water in Butcher's Creek. The shelter was formed by cavernous weathering and is impacted by chemical weathering, exfoliation, and granular losses, fissuring and vegetation present at the site. There was a yellow sandy deposit with artefacts. A sample of ten artefacts was recorded as part of this survey, and there was a mix of quartzite, quartz, and chert artefacts. The art surfaces were in poor condition, and there were five art groups evident, mainly comprised of line maze motifs.
Figure 23	Pending	Warragamba-243	Niche New Site 2019	Warragamba-243 is a Shelter with Deposit, Art and Artefacts located on the Eastern bank of the Cox River, across from Horse Arm Creek. There were seven artefacts recorded here.
Figure 23	Pending	Warragamba-287	Niche New Site 2019	Warragamba-287 is a Shelter with Deposit, Art and Artefacts. The shelter is located at a sandstone breakaway near the crest of the ridgeline containing Warragamba-285, and directly south of Warragamba-286. The art has indeterminate form and the surface is heavily abraded. There were three artefacts found outside the drip line. One of these artefacts was a basalt ground-edge axe head, with hafting materials still present.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Figure 23	Pending	Warragamba-295	Niche New Site 2019	Warragamba-295 is a Shelter with Deposit, Art and Artefacts. The shelter is located on mid-slope, to the east of Warragamba-303. The art is in poor condition and consists of black hatched markings. There were two artefacts found in the drip line.
Records of Shelter with Deposit, Art, and Isolated Artefact				
Figure 23	Pending	Warragamba-131	Niche New Site 2018	Warragamba 131 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of the ridgeline. The artefacts within this shelter are located within the floor deposit. Two faded art motifs present comprising two crescentic parallel lines and a series of radiating lines.
Figure 23	Pending	Warragamba-240	Niche New Site 2019	Warragamba-240 is a Shelter with Art, Deposit and an isolated artefact located beside an intermittent creek line that has permanent waterholes occurring along it. There were five art motifs and one chert flake found at this site.
Figure 23	Pending	Warragamba-276	Niche New Site 2019	Warragamba – 276 is a Shelter with Deposit, Art, and Isolated Artefact. The floor condition of the shelter is poor and disturbed due to a Wombat burrow. The art itself, located on the southern end of the shelter, is in poor condition and is very hard to determine. There is also a vertical abrasion patch in the shelter. The isolated artefact is a complete axe made from volcanic material.
Records of Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves				
Figure 23	Pending	Warragamba-113	Niche New Site 2018	Warragamba 113 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of a ridgeline. The site contains art, deposit and five axe grinding grooves. All the art depictions are indeterminate in form and drawn in charcoal.
Figure 23	Pending	Warragamba-116	Niche New Site 2018	Warragamba 116 comprises of a sandstone shelter formed through cavernous weathering and block fall in antiquity. This shelter is located on the mid slope of a ridgeline. The site contains over 100 art motifs, deposit and 30 + axe grinding grooves.
Figure 23	Pending	Warragamba-181	Niche New Site 2019	Warragamba-181 is a Shelter with Art, Deposit, Artefacts and Axe Grinding Groove located 100m from Ripple Creek, in the vicinity of Warragamba-182 and Warragamba-192. This shelter was formed by cavernous weathering and has been impacted by water wash and is inundated when the dam is full. The art surfaces are faded, and very little of the art remains due to water damage. There were four artefacts found down slope from the shelter as part of this survey.
Figure 23	Pending	Warragamba-254	Niche New Site 2019	Warragamba-254 is a Shelter with Art, Deposit, Artefacts and Axe Grinding Grooves located alongside an unnamed tributary of the Cox River, and west of both Warragamba-255 and Warragamba-256, and south west of Warragamba-253. The shelter was formed from an isolated boulder and is mid-slope on the gully formed by the creek. The art surfaces are impacted by graffiti, and weathering processes. Three artefacts were located, along with three groupings of abrasion patches, and two art panels.
Figure 23	Pending	Warragamba-277	Niche New Site 2019	Warragamba-277 is a Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves, located beside the stored water of the Cox River and west of Warragamba-272 and Warragamba-273. The art consists of two motifs in poor condition. There are seven grinding groves present in the shelter. The isolated artefact was a bifacially-flaked axe.
Figure 23	Pending	Warragamba-288	Niche New Site 2019	Warragamba-288 is a Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves. The shelter is located at the northern end of Moody's Hill, facing Commodores Hill and the Coxs River. The art consists of seven motifs in good condition. There are also five grinding grooves present. There were five artefacts found as part of this survey. The stone axe with hafting material was found at this location.
Figure 23	Pending	Warragamba-289	Niche New Site 2019	Warragamba-289 is a Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves. The shelter is located on the northern edge of Moody's Hill, facing Commodores hill. The art is in good to fair condition. There are five axe grinding grooves located on a large boulder to the north-east of the shelter. There were three artefacts found as part of this survey.
Figure 23	Pending	Warragamba-296	Niche New Site 2019	Warragamba-296 is a Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves. The shelter is located close to Warragamba-297, beside the stored water in Werriberri Creek. The art is in poor condition and located on the back wall of the shelter. There is a grinding patch with a small groove located 3-4m in front of the art. There were two artefacts found behind a boulder, including a green chert flake.

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Shelter with Deposit, Artefacts and Axe Grinding Grooves				
Figure 23	Pending	Warrabamba-261	Niche New Site 2019	Warragamba-261 is a Shelter with Deposit, Artefacts and Axe Grinding Grooves located mid-slope beside the stored water of the Cox River, south of Warragamba-257, and south west of Warragabma-259. The shelter was formed from an isolated boulder, and shows evidence of chemical weathering, water wash, wombat disturbance, fissuring and salt and granular losses. There were four artefacts located during this survey, and two axe grinding grooves.
Figure 23	Pending	Warragamba-292	Niche New Site 2019	Warragamba-292 is a Shelter with Deposit, Artefacts and Axe Grinding Grooves. The shelter is located on the northern side of Moody's Hill, opposite of Commodores hill. There is an abraded area on the back wall of the shelter which consists of three grinding grooves. Two artefacts were located as part of this survey.
Figure 23	Pending	Warragamba-307	Niche New Site 2019	Warragamba-307 is a Shelter with Deposit, Artefacts and Axe Grinding Grooves. The shelter is located above Cox River on the western side. There was an area of grinding grooves on a rock just within the drip line. As well as the abrasion patches present on the rock there were parallel abrasion patches at the northern and southern ends of the shelter, just inside the drip line. There were eleven artefacts found in the interior of the shelter and along the drip line.

9.2.9 Stone Arrangement Sites

There are two stone arrangement sites identified, one of which is located within the PUIA, whilst the other is located outside the EUIA and PUIA. Further details and photographs of each registered site is outlined in Table 37, Table 38, and Annex 1.

Plate 21: General view of landform at Warragamba-80

Plate 22: Detail of stone arrangement found at Warragamba-92

Table 37: Summary of Stone Arrangement Sites within the PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Stone Arrangement Sites				
Figure 23	Pending	Warragamba-80	Niche New Site 2018	Warragamba 80 is a possible stone arrangement. The area has been extensively cleared in the past.

Table 38: Summary of Stone Arrangement Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Stone Arrangement Sites				
Figure 23	Pending	Warragamba-92	Niche New Site 2018	Warragamba 92 is a Stone Arrangement Site which is presumed to be part of a field boundary associated with post-European-contact Aboriginal farming at the Nula Nula Aboriginal Reserve. These stone arrangements are located across a drainage line and are next to Byrnes Creek. While three Stone Cairns were recorded, there were 5 others nearby, but were outside the flooding impact zone.

9.2.10 Water Hole Sites

There are three Water Hole sites identified. Two of which are located within the EUIA, whilst the other site is located outside the EUIA and PUIA. These sites are associated with Aboriginal Dreaming and Open Camp sites. Further details and photographs of each registered site is outlined in Table 39, Table 40, and Annex 1.

Plate 23: General view of landform at Warragamba-63, submerged water hole site

Plate 24: General view of landform with water hole at Warragamba-133

Table 39: Summary of Water Hole Sites within the EUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Water Hole Sites				
Figure 23	Pending	Warragamba-63	Niche New Site 2018	Warragamba 63 is the Gungalook Waterhole. This is the main waterhole at Gungalook, and the surrounding country takes its name from this waterhole. The waterhole was created by Guringatch and it is one of the locations where his spirit still resides; it measures 180 m long by 60 m wide. The water hole is often located under the high-water mark of Lake Burragorang.
Records of Water Hole and Aboriginal Ceremony and Dreaming				
Figure 23	Pending	Warragamba-74	Niche New Site 2018	Warragamba 74 is the 'Jumping Woman Site.' There are two versions of this mythological story, one is post contact, with the other thought to be pre-contact. A woman jumps into the waterhole that is registered at the site. This same waterhole was also a location for hunting kangaroos- as the roos were driven across the water and trapped against the cliff. A macropod engraving has been reported at the location by Aunty Ivy Brookman, who is a former resident of the area. The engraving can no longer be found however due to the thickness of the vegetation regrowth.

Table 40: Summary of Water Hole Sites outside the EUIA and PUIA

Figure Reference	AHIMS ID	Site Name	Recorded	Description
Records of Water Hole Sites				
Figure 23	Pending	Warragamba-133	Niche New Site 2018	Warragamba 133 comprises of a waterhole located on the Cox's River.

10. Analysis and discussion

10.1 Site Distribution, Terrain Landform Type and Land Elements

Site distribution within the Subject Area follows the same pattern that has previously been outlined by the predictive model for the archaeological and cultural heritage assessment for the project.

Chart 2 and Table 41 present all Aboriginal cultural heritage sites identified as part of the project assessment and the slope class (how steep the land is) they are located on. The following slope classes, derived from the National Committee on Soil and Terrain 2009, were used for investigating Aboriginal cultural heritage site distribution within the surveyed landscapes:

- Flat or very gently inclined (gradients between 0° and 1°)
- Gently inclined (gradients between 1° and 6°)
- Moderately inclined (gradients between 6° and 18°)
- Steep (gradients between 18° and 30°)
- Very Steep (gradients between 30° and 45°)
- Precipitous (gradients between 45° and 72°)

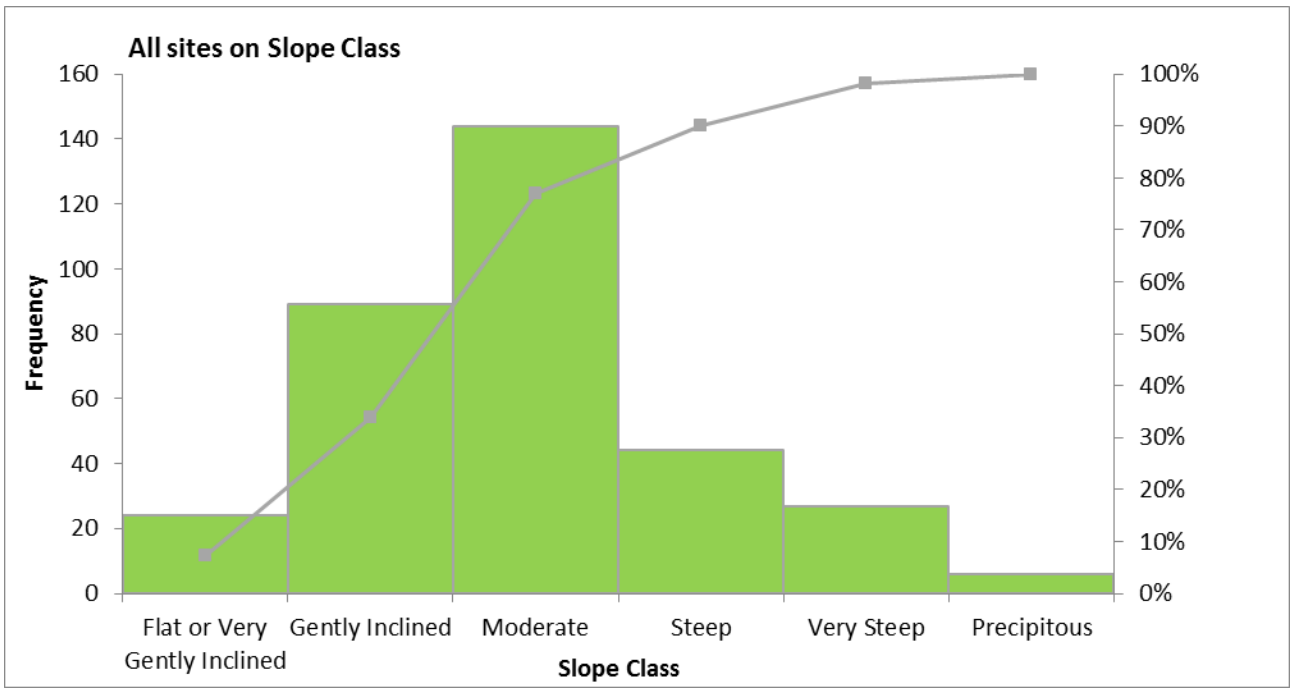


Chart 2: Number of sites per slope gradient class for the Warragamba survey

Chart 2 demonstrates that 144 of the 334 sites located during the assessment (highlighted in Figure 17) are located on the moderately inclined slopes. These moderately inclined slopes represent a slope class where both sandstone rockshelter sites and open artefact sites both occur frequently, and these two site types are the most frequent sites found within the Survey Area (Table 41).

Table 41: Aboriginal cultural heritage site distribution by slope class

Site features	Flat – Very Gently Inclined (0-2%)	Gently Inclined (2-6%)	Moderate (6-18%)	Steep (18-30%)	Very Steep (30-45%)	Precipitous (>45%)
Aboriginal Ceremony and Dreaming			1			
Aboriginal Resource and Gathering		1	1		2	
Axe Grinding Grooves	2	2	4			
Isolated Artefact	1	7	10	3		
Open Camp Site	12	63	101	19		
Open Camp Site with Axe Grinding Grooves	1					
Open Camp Site with Axe Grinding Grooves and Isolated Artefact			1		1	
Open Camp Site with Axe Grinding Grooves and Scarred Tree		1				
Open Camp Site with Scarred Tree	1	2	4	1		
Scarred Tree		3	1	1		
Shelter with Art		1		1	1	
Shelter with Art and Artefacts	1			1		
Shelter with Art and Axe Grinding Grooves			1	1	1	
Shelter with Art, Artefacts and Axe Grinding Grooves	1				1	
Shelter with Artefacts and Axe Grinding Grooves				1		
Shelter with Axe Grinding Grooves				1		
Shelter with Deposit		1	2		3	
Shelter with Deposit and Art		1		1	1	
Shelter with Deposit and Artefacts		2	7	7	4	3
Shelter with Deposit and Axe Grinding Grooves				4	3	
Shelter with Deposit and Isolated Artefact	1					1
Shelter with Deposit, Art and Artefacts	2		2	1	4	1
Shelter with Deposit, Art and Isolated Artefact				2		1
Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves			3	2	3	
Shelter with Deposit, Artefacts and Axe Grinding Grooves		1	1	2	1	
Shelter with Deposit, Artefacts, Axe Grinding Grooves and Tool Marks			1			
Shelter with Deposit, Axe Grinding Grooves and Isolated Artefact				1	1	
Shelter with Isolated Artefact	1					
Stone Arrangement		1	1			
Water Hole	1		1			
Water hole and Aboriginal Ceremony and Dreaming						1
Total	**24**	**86**	**142**	**49**	**26**	**7**

The distribution of Aboriginal cultural heritage sites is dictated to some extent by the rugged nature of the landscape, with open artefact sites and sandstone shelter sites being in distinctly different areas. The majority of the sites suitable for Aboriginal occupation and transient use on relatively steeper slope classes comprise of sandstone overhangs, as outlined in Section 5. Comparing slope analysis and distribution of

sites per slope gradient in Chart 3 and Chart 4 supports the predictive model for the project as to where Aboriginal sites are likely to be located based on slope analysis.

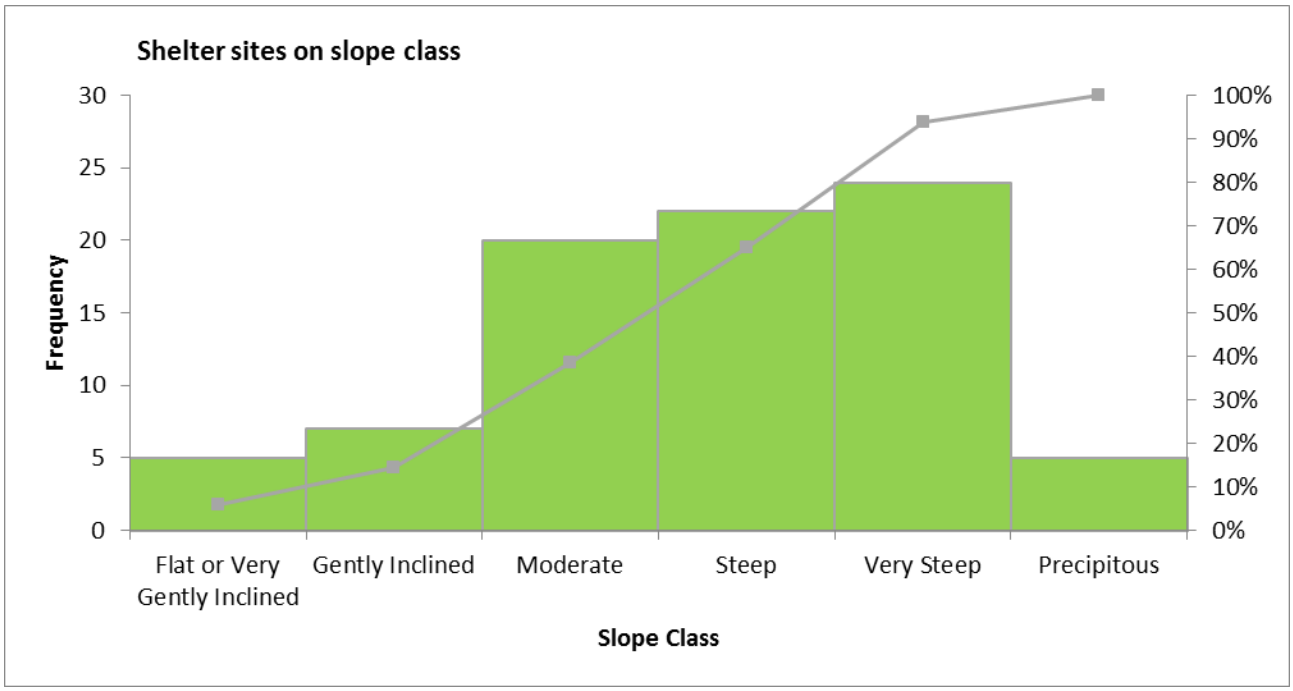


Chart 3: Number of shelter sites per slope gradient class for the Warragamba survey

Chart 4: Number of open artefact sites per slope gradient class for the Warragamba survey

The Project's Aboriginal cultural heritage site locations and types vary from those assessments carried out within the Hawkesbury sandstone formation that makes up the Lake Avon and Cordeaux catchment situated to the south-west of the Subject Area. The predictive model as outlined by Biosis (2007a) demonstrated that the Aboriginal heritage sites located on the Woronora Plateau within Dendrobium Areas 5 and 6 are mostly located within the moderate to steep slope set, which are the slope classes where there is the formation of overhangs suitable for use and occupation during Aboriginal people's past land use.

Within the Project's Subject Area there is a greater representation of sites located on gently inclined to moderate landforms (Figure 16). Most of these sites are open sites with high numbers of stone artefacts. This difference is explained by the type of landscapes present within the Subject Area compared to the Woronora Plateau, which is a sandstone plateau with steeply incised drainage lines, and narrow gorge and gully bases. At Warragamba there is a far more diverse set of landforms. Broad based valleys are present with alluvial flats, open watercourses and large sandstone platforms that are suitable for axe grinding. These landforms presented a much more open landscape in terms of movement, hunting, resource gathering and habitation. Sites are present in high numbers across moderate to gently sloping spurs and foot slopes that provided elevated positions above the valley floors and midpoints in the landscape. At higher elevation frequent rockshelters provided habitation sites between the cliff lines and steep slopes framing the courses of the Wollondilly, Cox's and Warragamba rivers and their tributaries.

The information presented in this Aboriginal Cultural Heritage Assessment and Archaeological Report, collected from previous archaeological work, stories and cultural knowledge, and the results of the Project's surveys show that Gundungurra people were using all parts of the diverse landscape. While some site types such as rockshelters and open artefact sites occur in quite specific and predictable landscape areas based on slope, terrain and resource modelling, Warragamba is an area where individual sites contribute to a rich cultural and archaeological landscape.

Site and artefact distribution were found to vary across the Subject Area and variations to patterns reported in projects in the wider region were observed. The predominant pattern of occupation observed was that the large majority of the artefact sites (Open Camp Sites and Isolated Finds) were located at lower elevations within close proximity to the former watercourses, alluvial flats and banks now occupied by Lake Burragorang; a pattern that is consistent with resource modelling throughout the region and predicted to be the case within Section 7 of this assessment.

The following analysis and discussion refer to those sites within the Project Subject Area only. Due to the potential of impacts to these site types.

10.2 Artefact Assemblage

Raw material selection was found to be consistent with other projects across the region. The Subject Area did contain a wider range of technologies, including ground edge, grinding, bipolar, anvil rested and percussion flaking.

Within the Subject Area the following materials were used in stone artefact development: basalt, chert, silcrete and quartz. The majority of which would have been available within close proximity to the Subject Area. Basalt used frequently to develop ground edge axes, anvils and grinding stones within the Subject Area, is available as water rolled pebbles in the Grose River and other major streams. Chert occurs naturally in metamorphosed sedimentary seams, such as the Burragorang Claystone, outcropping at the base of the sandstone/ shale cliff lines of the great valleys. Again, it would have also been found as pebbles by Aboriginal people within the Grose and other rivers. Silcrete would have been resourced from the Cumberland Plain-and would have been extracted from well-known quarries and was liable to be transported to the Burragorang Valley for use. Quartz was readily available in the nearby Wentworth Falls area (Stockton and Merriman, 2017:43-45).

The occurrence of these stone types within the Open Camp Sites of the Subject Area demonstrates that the Aboriginal people of the valley needed access to suitable stone and were in some cases were ready to transport it over long distances (Stockton and Merriman, 2017: 45).

10.2.1 The stone artefact assemblage

The most frequent site type recorded during the archaeological and cultural heritage surveys were sites that contained stone artefacts. Stone artefacts were located in rockshelters, or as individual artefacts or concentrations of artefacts in the open. Below full supply level of the dam in the EUIA conditions of archaeological exposure and visibility are ideal for discovering stone artefacts, as top soil and vegetation has been eroded away by spending long durations underwater, meaning the artefacts are visible on these bare lag surfaces.

During the surveys an artefact sampling strategy was used. At places where there were fewer than 10 - 20 artefacts all artefacts had basic attributes recorded at places where there were more than 10 - 20 artefacts a random sample of artefacts were selected for attribute recording, and in addition any notable artefacts (examples of notable artefacts include axes or grind stones) were also added to this sample.

10.2.2 Number and types of artefacts present

A total of 1765 artefacts had their attributes recorded during the surveys. Artefacts were sampled from both open sites and rockshelters. The sample represents 1348 artefacts from 217 open sites, and 417 artefacts sampled at 63 rockshelter sites. The sites where artefact attributes were recorded included both new sites, and sites that were already recorded. The highest estimated number of artefacts at a site was greater than 300 and the highest sampled number of artefacts at a site was 38 artefacts at Warragamba-258, while the lowest sampled number at a site was one, with many sites containing only one visible artefact at the time of survey. The average number of artefacts sampled at a site was 6 artefacts, with 80% of sites having 10 artefacts or less sampled, as shown in Chart 5.

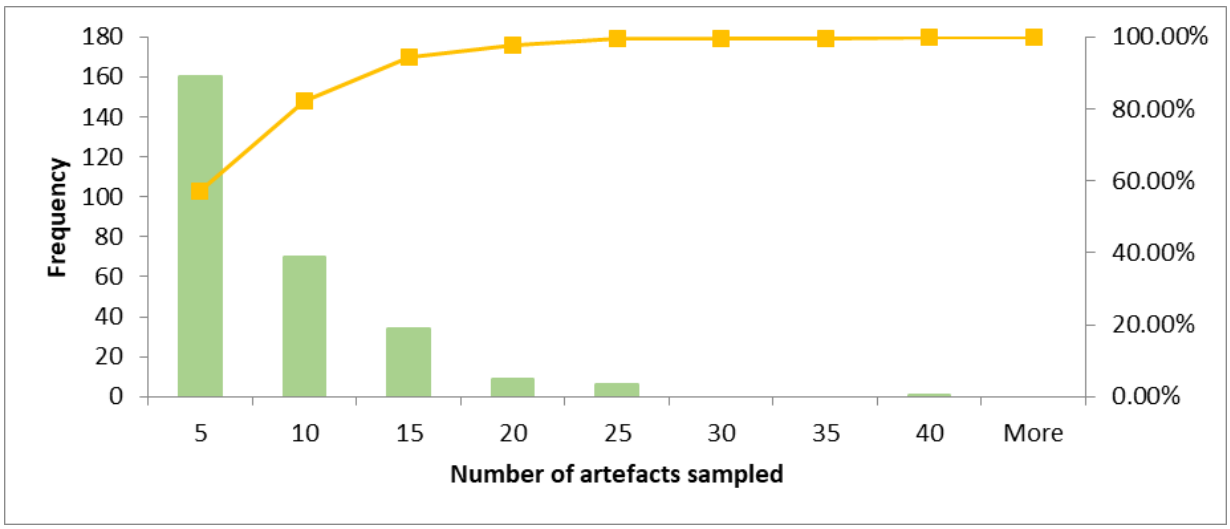


Chart 5: Histogram of the number of artefacts sampled at sites during the surveys.

The stone artefact assemblage recorded during the survey consisted entirely of utilitarian artefacts, with no secret or sacred objects recorded. The types of artefacts present in the sites recorded during the surveys is diverse and is summarised in Table 42.

Table 42: Summary of artefact classes recorded during the surveys

Class	Number	Percentage
Flaked (all flaked stone)	1061	60%
Core	524	30%
Axe or Axe Fragment	99	5%
Tool (flaked)	49	3%
Hammerstone	28	2%
Grinder	4	<1%
Total	**1765**	

Flaked artefacts are the most common class of artefact, accounting for 93% of the entire assemblage. Proportionally there are a high number of cores present in the assemblage, which may be explained by selection bias when sampling. There was a high number of axe (hatchet) or axe-fragments recorded during the survey. Again this may be explained partly by sampling bias for recording notable artefacts, but is also probably a reflection of the relatively intact nature of the archaeological record and the good levels of exposure and visibility below the FSL. Unlike many other areas in New South Wales the relative remoteness of the Subject Area means there was relatively little artefact collection in the past to remove conspicuous artefacts like axes. The richness and relative intactness of the stone artefact assemblage is demonstrated by the presence of all the utilitarian classes of stone artefacts that would have been being used by Aboriginal people in the study area in the past: flaked stone for sharp edged tools; hammerstones for making flaked stone; ground edge artefacts for durable hatchets/axes; and grinding stones for preparation of food, medicine or pigment.

10.2.3 Artefact raw materials

A broad range of raw materials were present in the sample assemblage, as summarized in Table 43.

Table 43: Raw materials recorded in the assemblage.

Raw Material	Number	Perccentage
Chert	799	45%
Quartz	418	24%
Basalt	341	19%
Volcanic	102	6%
Quartzite	33	2%
Other/Not identified	18	1%
Fine Grained Siliceous	17	1%
Mudstone	16	1%
Silcrete	12	1%
Sandstone	5	<1%
Petrified Wood	2	<1%
Hornfels	2	<1%
Total	**1765**	

The most common raw material in the assemblage was chert which accounts for almost half of all the records. Quartz and basalt also make up a large proportion of the raw materials present in the sample. A typical range of raw materials for the region makes up the minor assemblage components, with quartzite, silcrete, mudstones and siltstones and petrified wood being present. The relative lack of abundance of silcrete contrasts with the adjacent Cumberland Plain, where assemblages are usually made up in large proportion by this raw material, which occurs locally on the Plain (Attenbrow 2010: 120). There are no known raw material quarries in the subject area or its surrounds, however the most frequent raw materials in the Warragamba assemblage are all rock types that occur locally within the Triassic and Permian sedimentary units (chert, quartz) and volcanic caps (basalt).

A high proportion of cortex (the outer weathering rind of a rock) was recorded on the artefacts sampled. This further suggests that the stone sources being utilized by Aboriginal people in the past were local to the study area and surrounds, as distance decay models assume that cortex on flaked stone artefacts will be less and less and eventually not present with distance from the stone source. The cortex amounts on the stone assemblage are summarised in Table 44.

Table 44: Amount of cortex on flaked stone artefacts

Cortex Amount	Number	Percentage
0	707	40%
1-25%	375	21%
26-50%	354	20%
51%-99%	322	18%
100%	7	<1%
Total	**1765**	

In summary 60% of the artefacts sampled had some cortex present on their surface, which is a very strong indicator that the stone sources are residing with or very close to the locations and places where the artefacts were being made. The type of cortex present on artefacts was also recorded, and in every case it was recorded as pebble or cobble cortex. This type of cortex is rounded and is usually associated with the rocks having come from, or spent some time in a stream or weathering environment that produces a rounded rock, such as in streams or rivers. This suggests stone artefact raw materials were being sourced from cobble beds within the rivers, or possibly from talus slopes where cobbles and pebbles incorporated into the sedimentary geology would be eroding.

10.2.4 Artefact manufacturing

This also suggests a relative abundance of stone sources for making artefacts, which is suggested by the flaking directions that were recorded on cores from the assemblage (note flaking direction was not recorded for all cores). The majority of cores had only a single flaking direction, and a high proportion having flaking in two directions but only very few exhibiting flaking in multiple directions (Table 45).

Table 45: Flaking direction on cores

Flaking direction	Number	Percentage
Unidirectional	140	53%
Bidirectional	103	39%
Multidirectional	19	7%
Bipolar	2	1%

The number of flaking directions is also an indicator of stone raw material abundance or constraint, because in environments where stone artefact making raw materials are rare cores will be flaked more intensively and from multiple directions to exhaust the supply of flakes the core has available. In situations where stone artefact raw materials are more abundant, unidirectional and bidirectional flaking will be used.

The survey recorded two instances of bipolar cores, and several anvils, hammerstones and percussion stones. These artefacts demonstrate that the bipolar flaking method, which involves “splitting” raw materials into flakes by resting them on an anvil and hitting them with a hammerstone was being used in the study area.

The assemblage of complete flakes from the Warragamba surveys does not show any particular flaking strategy, although this could be the result of the relatively small sample. As noted above the manufacture of flaked stone artefacts appears to have been unconstrained by raw material availability. However, looking at the four most frequent raw materials, while there is no apparent strategy related to the flaking of different raw materials (such as blades being made form chert, as an example) the raw materials do appear to place a constraint on the size of the flakes being manufactured. Chart 6 presents a scatterplot of complete flake length against width (in a scatterplot like this blade flakes will plot toward the left hand margin). Generally all raw materials were used to produce flakes that have a more or less constant relationship between their length and width (that is the get wider as they get longer and vice versa).

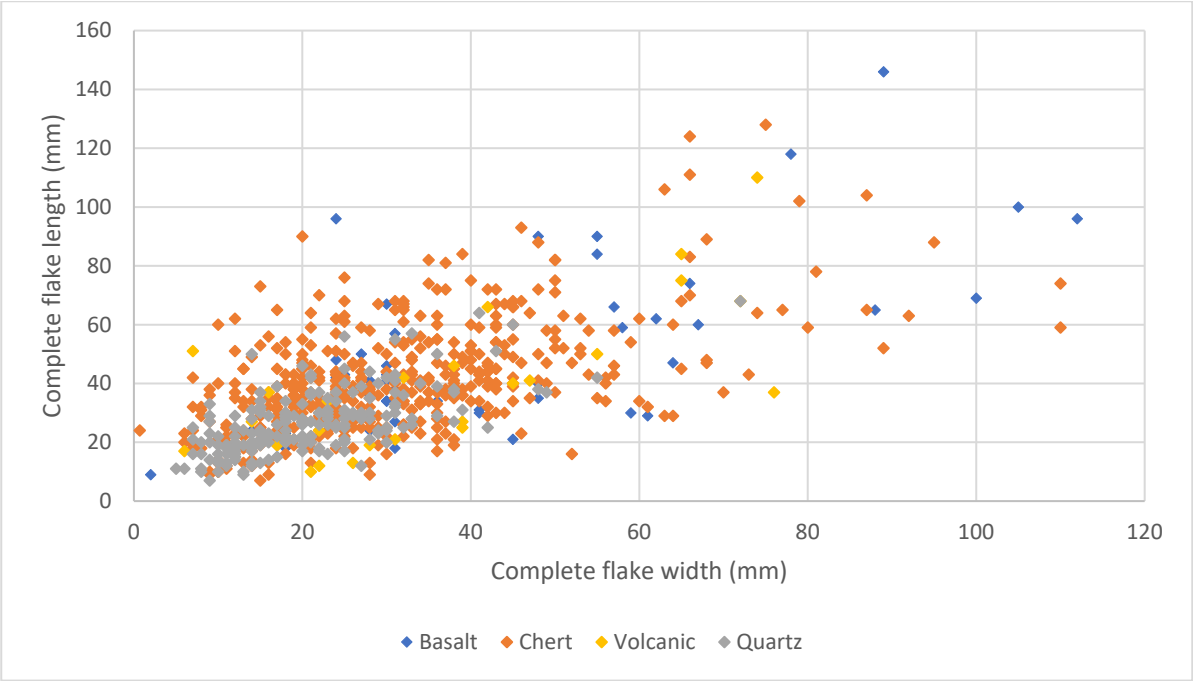


Chart 6. Scatterplot of length versus width for complete flakes of main raw material types

However, one thing that is apparent from Chart 6 is that quartz was used to make smaller artefacts than the other raw materials. This possibly reflects the raw material cobble size of the quartz being smaller, and also possibly that quartz flakes less consistently than fine grained basalts and cherts, so it cannot be worked to flakes consistently larger than 40 mm in either length or width (Table 46).

Table 46: Complete flakes summarised by raw material, average length and average width.

Complete flakes		
Raw Material	**Average of length (mm)**	**Average of width (mm)**
Basalt	48.9	43.7
Chert	41.5	31.6
Quartz	26.6	21.0
Volcanic	38.4	35.3

Another explanation for the difference in quartz flake size could be a change in the way people were using the landscape and the raw materials in it. In the greater Sydney area stone artefact assemblages from around 4,000 years ago are comprised of backed artefacts of the Eastern Regional Sequence made on fine grained siliceous raw materials such as silcrete, tuff and chert. At around 1,400 years ago the stone artefact assemblages change dramatically, with the backed artefacts and fine grained siliceous materials being replaced by quartz. This sequence has been recorded at Bull Cave, which is near to the study area (Attenbrow 2010: 120-121). The presence and relative abundance of quartz compared to chert may reflect the use of the same sites over time, or indeed the use of different parts of the landscape at different times over these more recent millennia that Aboriginal people have lived in the study area and surrounds.

10.2.5 Flaked stone tools

Flaked stone artefacts that had undergone secondary manufacture to form specific stone tools represent approximately 3% of the assemblage. The secondary manufacture process is called “retouch” as it involves additionally flaking on the edge of stone artefacts to fashion the edge for a particular purpose. The

different types of retouch present in the assemblage included: scalar (usually interpreted to have been used for scraping style tasks); notched (for sawing, wood working); backing (blunting of an edge to haft to a handle) and use-wear (damage apparent on the edge of an unmodified flake edge, or retouched edge). In a couple of cases working edges of flaked stone tools were ground or abraded.

The 49 flaked stone tools were manufactured primarily on the chert and quartz raw materials, broadly in keeping with the relative abundance of these materials to the assemblage as a whole (Table 47).

Table 47: Flaked stone tool raw materials

Raw material flaked tools	Number	Percentage
Chert	26	53%
Quartz	18	37%
Volcanic	4	8%
Fine Grained Siliceous	1	2%
Grand Total	49	

10.2.6 Summary

Basic stone artefact attributes were recorded for a sample of 1765 artefacts during the survey of the study area. The artefacts were recorded from both open sites where there was excellent exposure and visibility below FSL, and from rockshelters.

The assemblage contained a range of artefacts that were based on raw materials and retouched items probably represent in the Eastern Regional Sequence. A high proportion of ground edge axes and broken axes were a notable component of the assemblage. Although it is not possible to build a chronology from the limited sample and surface finds recorded during the survey the dominant numerical presence of chert and quartz is suggested of the phases of the Eastern Regional Sequence over the last 5,000 years. Unlike the neighboring Cumberland Plain silcrete is not well represented in the assemblage. The presence of a high proportion of cores, a high representation of cortex on artefacts, and the relative lack of flaking intensity of cores and the likely local provenance based on surrounding geology of the artefact raw materials all suggest local raw materials and manufacturing strategies were used in the valley. It is likely the study contains a local variation of the Eastern Regional Sequence, where the general characteristics of backed artefacts on fine grained materials and later quartz use are influenced by local variables such as stone raw material and general resource availability. This will sit within the broader framework of the cultural landscape, but at this stage the data is not detailed enough to allow direct comparisons or interpretation with the intangible heritage aspects.

Based on the results of this survey there is high potential for intra-site and inter-site research potential with the stone artefact component of the cultural landscape. Future research questions could focus on the following avenues:

- The timing and location of changes in the Eastern Regional Sequence in the study area compared to other parts of greater Sydney and surrounds;
- Where the sources of flaked and ground stone raw materials are within the study area surrounds and region;
- Given the high number of axes and axe fragments a non-invasive petrological study to document the distribution and interpret the movement of axes across the landscape;

- Exploration of the relationship between the archaeological sites, the stone artefact assemblages they contain and the storied landscape.

The survey results demonstrate that there is a rich and intact stone artefact assemblage in the study area. Artefacts are present in high frequencies in both open contexts and in rockshelters. The artefacts are of value in and of themselves as a material link in the cultural landscape, and may provide an avenue through future research to further understanding the past Aboriginal land-use of the study area.

10.3 Aboriginal Resource Gathering

There were four Aboriginal Resource and Gathering sites located during the survey. Three of these sites comprise of limestone features within proximity to the FSL of the Dam (EUIA). It has been suggested by Michael Jackson (pers. Comm during the survey) that these are potential medicinal sites, and that the water contains medicinal properties used to heal an individual of ailments from this limestone spring- this is referred to are Morle Blanc within this assessment. Within the larger Burragorang area Smith states that the Alum Springs Creek area contained two sources of medicinal mineral water. 'These were cave water, containing natural antibiotics used in treating skin diseases, found in a small cave beside Alum Springs Creek and the alum water found in the main Creek which was used to treat digestive complaints. Mineral water occurs at Mouin spring, where water containing soluble iron salts reacts with the soil and oxygen to produce hydrated iron oxide, a source of ochre (Stockton and Merriman, 2017:156-157).

The final resource and gathering site are Gungalook Farm. This site has post- contact significance to the Aboriginal community as the Riley family have over 100 years of historical association with the land until they were required to leave due to the rising waters of Lake Burragorang in the 1950's. The Riley family have continued their connection to the area through maintaining cultural traditions and custodianship. Ashes of family members are scattered here. The remains of the family home are located here. A further three stone tools were also observed at this location.

10.4 Axe Grinding Groove Sites

Axe Grinding Grooves are the most common rock marking within the Blue Mountains (Stockton and Merriman, 2017:89). Axe Grinding Grooves are important in highlighting how Aboriginal people used the landscape for grain processing, spear and stone axe sharpening/ maintenance and development. The Subject Area contained three Axe Grinding Grooves sites. The limited number of axes grinding groove sites can be attributed to the water levels at Lake Burragorang during this assessment, as well as several suitably sized platforms for such practices being covered in silt and or vegetation. These sites hold significance to the local Aboriginal community as evidence of past occupation and use of the Subject Area as well as an educational tool for younger generations.

10.5 Scarred Trees

The Subject Area contains no trees that have been assessed as culturally modified trees (i.e. the source of scarring is considered to be the result of Aboriginal cultural activities in the past) and trees that have been deemed to be "Possible Culturally Modified Trees" (i.e. the source of scarring is uncertain). As highlighted by Jim Smith the Gundungurra people would have a much wider perception and association when looking at trees. As these would be scanned for food resources as well as some species of tree being used to produce bowls, canoes, and sheeting for shelters. Carving on trees would have been used to indicate burials, sacred symbols and to identify initiation grounds (Stockton and Merriman 2017:129).

The clear identification of culturally modified trees of Aboriginal cultural origin in the Subject Area is challenging due to its long history of occupation and clearance for the development of Warragamba Dam.

10.6 Rockshelter Sites

Of the 334 Aboriginal cultural heritage sites identified as part of this assessment, 34 comprise sandstone shelter sites that have either one or a combination of art, deposit, grinding grooves, abrasion patches and/or potential archaeological deposit. As outlined in Section 10.1, the Permian and Triassic sandstone and siltstone landscapes within the Subject Area lends themselves to this site type to be used by past Aboriginal peoples for artistic expression, occupation, and transient use. Like axe grinding grooves, these site types are significant to the local Aboriginal community as they evidence the past occupation of the area and can be used as an educational tool for younger generations.

Warragamba-258 (AHIMS ID# pending) is a shelter with artefacts and axe grinding grooves located beside the stored water of the Cox River. This shelter is located in the EUIA and partially below the FSL in Lake Burragorang and highlights the potential impacts to shelter sites that are subject to submersion. There is mineral formation and weathering patterns evident from the rock surfaces which experience immersion by the stored water, and there is no deposit due to erosion from this process. A large scatter of artefacts is visible at the site, out of which a sample of thirty-eight were recorded. There was also three axe grinding grooves located during this survey.

Warragamba-288 (AHIMS ID# pending) is a sandstone shelter that falls outside the Subject Area and contained a hatchet with a large amount of mastic remains still present from where it would have originally been hafted. Currently there are two known examples of a similar nature that have been identified as part of this research. One was located during the Eagles Reach assessment within the Wollemi National Park and is currently held by the Australian Museum and the second hatchet is located within the collection of the Cambridge Archaeology and Anthropology Museum and was collected in 1836. Due to the small number of these types of axes being located this site is given a high scientific (archaeological) significance rating.

10.6.1 Desktop Rock Art Assessment methodology

Rock art represents many aspects of Aboriginal culture such as mythological origins and beings, which are then imprinted in the topography of the landscape. As a result, the energy or sentience of the mythological being is understood as remaining in the physical environment. In this sense, rock art serves to animate the landscape, showing mythological beings and their cultural routes or pathways. This inscription of meaning onto the landscape applies not only to the actions of mythological beings but also to the actions of the ancestors and events in historical time, animals, and objects. The inscription of meaning onto the landscape, a process partially captured in the term ‘Dreaming’, is not restricted to a distant and mythological past but is a continuous cultural process within which people are empowered to create new meanings. In relation to the Subject Area, ‘Dreaming’ stories such as the Buru Dreaming Story and the Gurrangatch-Mirrigan Dreaming Story have been attributed to several cultural places and shelters within the Subject Area, outlined in the Cultural Values Assessment.

The images depicted within the shelters of the Subject Area are part of a regional pigment art style that extends across Hawkesbury sandstone landforms of the Sydney and Hunter regions of NSW (Attenbrow 2002:146). The Subject Area sample is not large enough to characterise the rock art of the Burragorang, however a number of general statements are possible with regard to the broader Sydney and Greater Blue Mountains regions. A comparative analysis of the rock art of the Subject Area with that of selected samples of rock art from the region, allows a regional consideration of archaeological values.

To complete a desktop comparison of the Rock Art application techniques and motif types within the Greater Blue Mountains region and the Subject Area the following methodology was developed in consultation with Heritage NSW.

Niche completed AHIMS searches of the following regions that are a similar landscape that would have been used by the Darug and the Gundungarra peoples in the past. The shelter and art types that are anticipated to be present within these areas aligned with those found within the Warragamba Project Area:

- Colo River;
- Grose Valley;
- Kowmung River; and
- Nattai National Park

The additional desktop research focused on characterising and quantifying art assemblages from the different regions. To this end from the AHIMS site cards the following information was extracted for comparison and analysis with the data collected during the field assessment for the Warragamba Project:

- motif type
- frequency of motifs
- type of motif application techniques; and
- material used for application.

As a result of the AHIMS searches completed of the comparison regions (AHIMS Client IDs #537838, 537840, 537841, 537842, 537843, 537845, 537846, 537847, and 537848) a total of 269 shelters or rock platforms with engravings with either one or a combination of art, deposit, grinding grooves, abrasion patches and/or potential archaeological deposit were identified to be included within the desktop study. Rock engravings were included as their motifs are not dissimilar to those drawn or etched into sandstone shelters within the region. Upon requesting the site cards, it was determined that 63 of these sites had an access restriction on them as they were part of the Wollemi Rock Art Project. A request for the contact details of the appropriate person to request access to these sites' information was put into HeritageNSW on the 7th October 2020. Despite repeated attempts to get in contact with the Knowledge Holder the Niche team was unsuccessful. Due to this lack of permission these 63 sites could not be included within the study. Chart 11 outlines the comparative numeric count of motifs, which includes partial motifs where noted (total n= 1867). In addition to the numeric count of whole and partial motifs.

10.6.2 Assemblage size

There were 34 Shelters identified during the survey for the Project. Of the 34 shelter sites located within this assessment, a high proportion contained multi-component archaeological records indicative of intensive, or repeated occupation, with combinations of art, artefacts, axe grinding grooves and deposit at thirty-four (34) of the shelters. Of the total number of shelters identified during the survey for the project a total of eight (8) fall within the Subject Area:

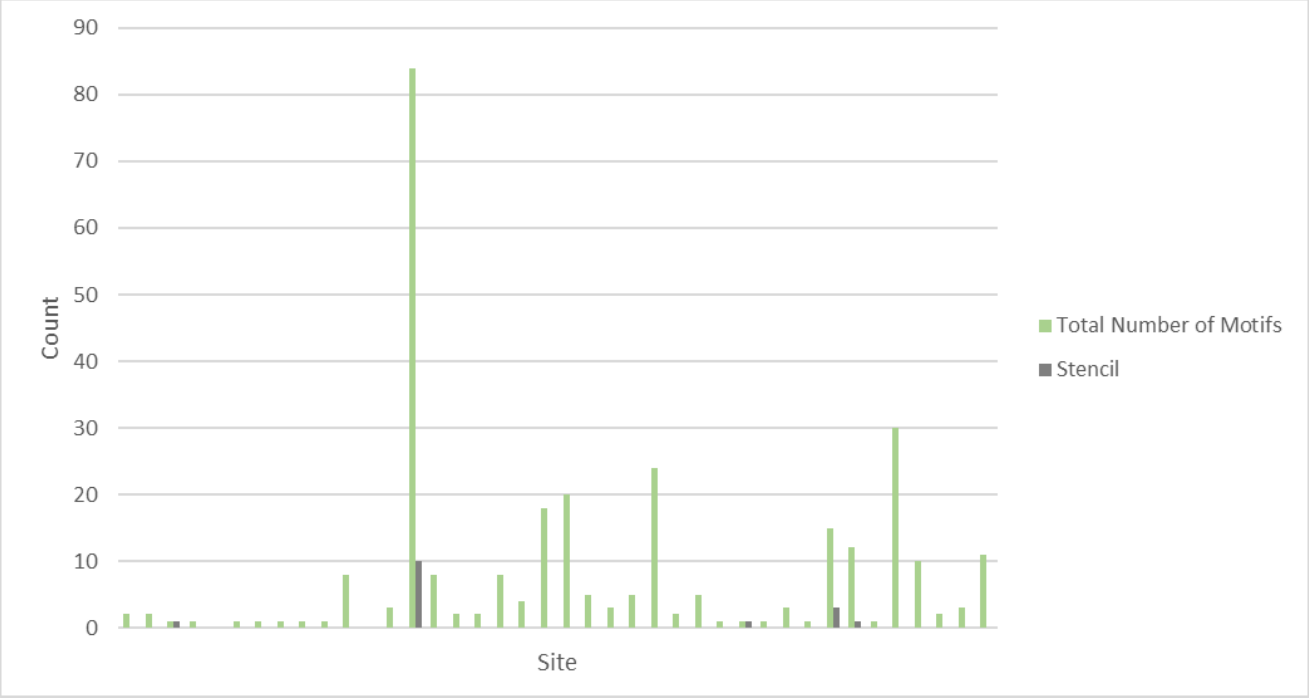
- Policeman's Point (AHIMS ID# 45-4-0186)
- Warragamba-104 (AHIMS ID# pending)
- Warragamba-113 (AHIMS ID# pending)
- Warragamba-132 (AHIMS ID# pending)
- Warragamba-149 (AHIMS ID# pending)
- Warragamba-187 (AHIMS ID# pending)
- Warragamba-193 (AHIMS ID# pending)
- Warragamba-299 (AHIMS ID# pending)

This accounts for 20% of all of the sites identified during the assessment. One (1) of these sites within the Subject Area contain art (Warragamba-113 AHIMS ID# pending), which accounts for 2% of all sites identified within the Subject Area (PUIA). This site is highlighted by being shaded a darker grey.

10.6.3 Motifs

There is a total of 2 motifs present at the shelter with Art within the Subject Area. Which gives a mean motif count of 2 motifs per site. This is slightly lower than the mean motif count of 7 motifs per site within the comparative data analysed for the Project. There is a variety of art motifs depicted within those sites that fall outside of the Subject Area, however the majority of these sites contain only one or two motifs, that are often indeterminate. Whilst these sites have been given a low scientific (archaeological) significance rating these sites are still important in analysing their distribution within the landscape as it gives an insight into how past Aboriginal people used the landscape. The site with the highest motif count Warragamba-116 (AHIMS ID# pending) falls outside of the Subject Area however is of an obvious high scientific (archaeological) significance, as it provides opportunities to analysis motif type, style and application techniques as well as its differing in preservation, which perhaps is due to this shelters location within the landscape and its formation through cavernous weathering which has allowed for a natural protection of the art panels. Chart 7 presents the motif and stencil count for each art site in the Survey Area, sorted by motif count.

Chart 7: Motif and stencil count per site within the survey area



The images depicted within the shelters of the Survey Area are 'part of a regional style that stretches from the southern rim of the Hunter Valley in the north, to the Woronora Plateau in the south, and as far west as the Blue Mountains- basically the extent of the Hawkesbury sandstone.' (Attenbrow 2002:146). Whilst the Survey Area is not large enough to detect major trends in motif types, a number of the motif types have previously been observed during assessment within the Blue Mountains region surrounding the Subject Area. These motif types comprise Men, Anthromorphic figures, zoomorphic figures, Anthromorphic figures with radiating lines, a snake, six hand stencils, circles, complex non-figurative and zig zag lines. Chart 8 outlines the frequency of basic motif type as depicted within the comparative regions data.

Chart 8: Number of basic motif type within the comparative data

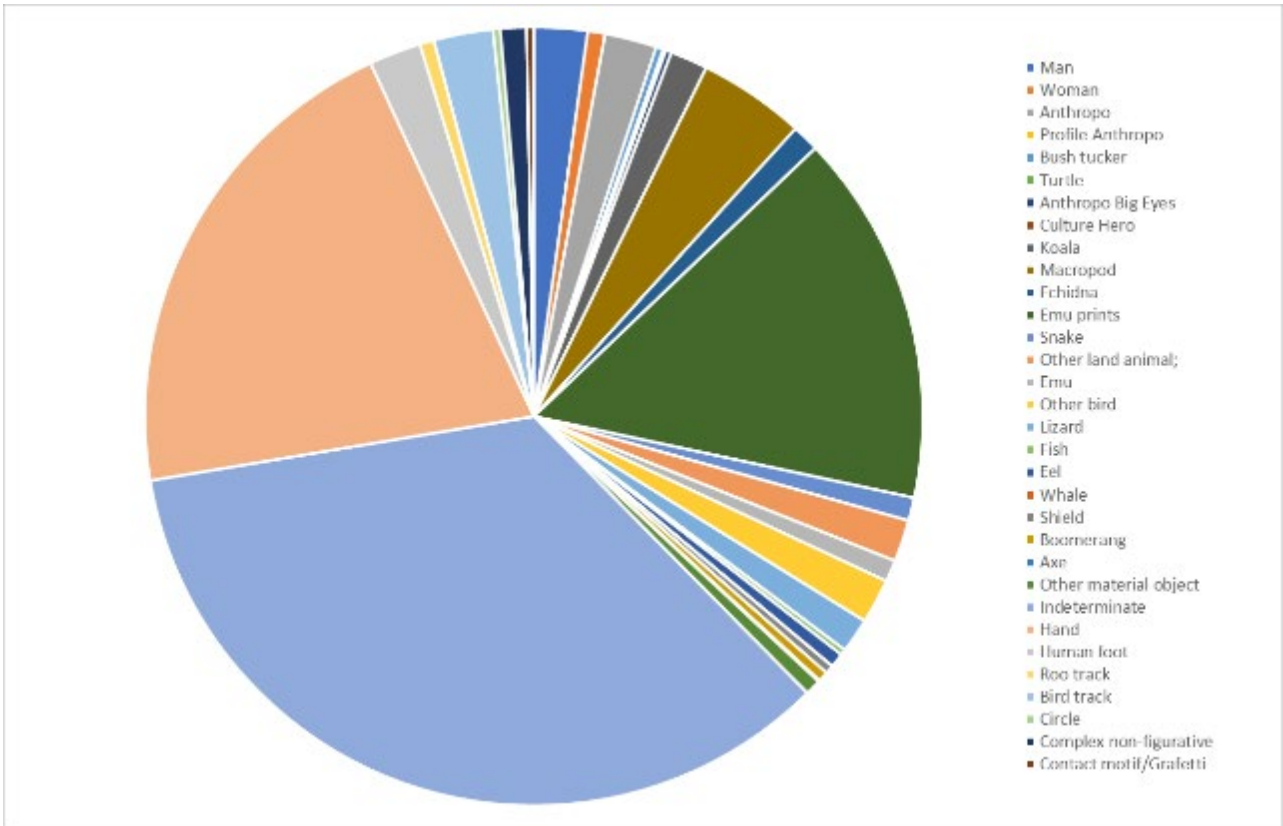


Chart 9: Number of basic motif type within the area assessed for the Warragamba Project

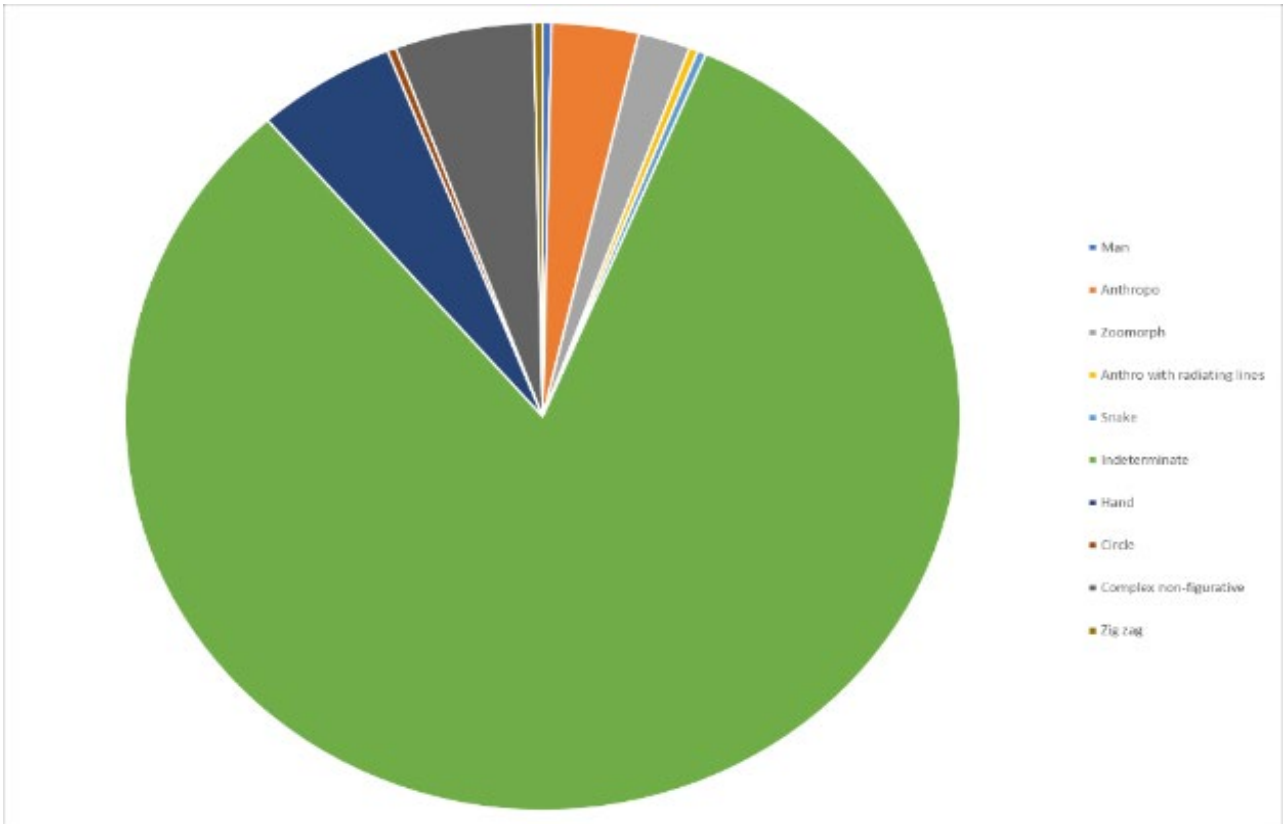


Chart 9 outlines the frequency of basic motif type within the area assessed as part of the Project. Twenty six (26) sites within the Survey Area depict indeterminates (183 indeterminates in total) drawn in both

orange and red ochre as well as charcoal, these motif types often could not be attributed as they are heavily worn due to the open nature of the shelters within the Subject Area. Within the site contained within the Subject Area Warragamba-113 AHIMS ID# pending both motifs are indeterminates drawn in charcoal.

10.6.4 Techniques

As with previous assessments of rock art within the greater Sydney region Chart 9 demonstrates (Biosis Research 2008 and Niche Environment and Heritage 2020) the most common type of expression is charcoal outline/infill with 153 motifs having been drawn or painted using this medium (Warragamba-144, AHIMS ID# pending, Warragamba-193, AHIMS ID# pending, Warragamba-279, AHIMS ID# pending, Warragamba-281, AHIMSID# pending and Warragamba-300 AHIMS ID# pending). Orange, white, and red ochre is used for 23 outline and solid motifs at thirteen of the sites identified during the survey, though none that fall within the Project Subject Area. Three sites also contain red hand stencils and white hand stencils (Warragamba-116, AHIMS ID# pending, Warragamba-281, AHIMS ID# pending, Warragamba-285, AHIMS ID# pending). Within the wider Gundungurra region stencilled hands are one of the commonest art motifs in Gundungurra Country. Maurice Hayes highlights through his discussions with Gundungurra people it is difficult to obtain reliable information in relation to stencils, however he was given to understand that the "hands were the imprints of those of their deity, when on earth (Stockman and Merriman, 2017: 152)."

Warragamba-116 (AHIMS ID# pending) falls outside of the Subject Area and has the most extensive number of motifs and application types demonstrating both drawn and stencils, with extensive layering of motifs giving the implication that the site would have been used over numerous time periods. Further to the art motifs and application there are over 30 grinding grooves and abrasion patches located within the floor of the shelter. As a result of these extensive motifs and application techniques this site was given a High Scientific (archaeological) significance rating. This site was also given a high cultural significance by the RAPs for the project.

Warragamba-115 (AHIMS ID# pending) and Warragamba-292 (AHIMS ID# pending) contain scratched in motifs.

Chart 10: Colour of motifs observed during the Warragamba assessment

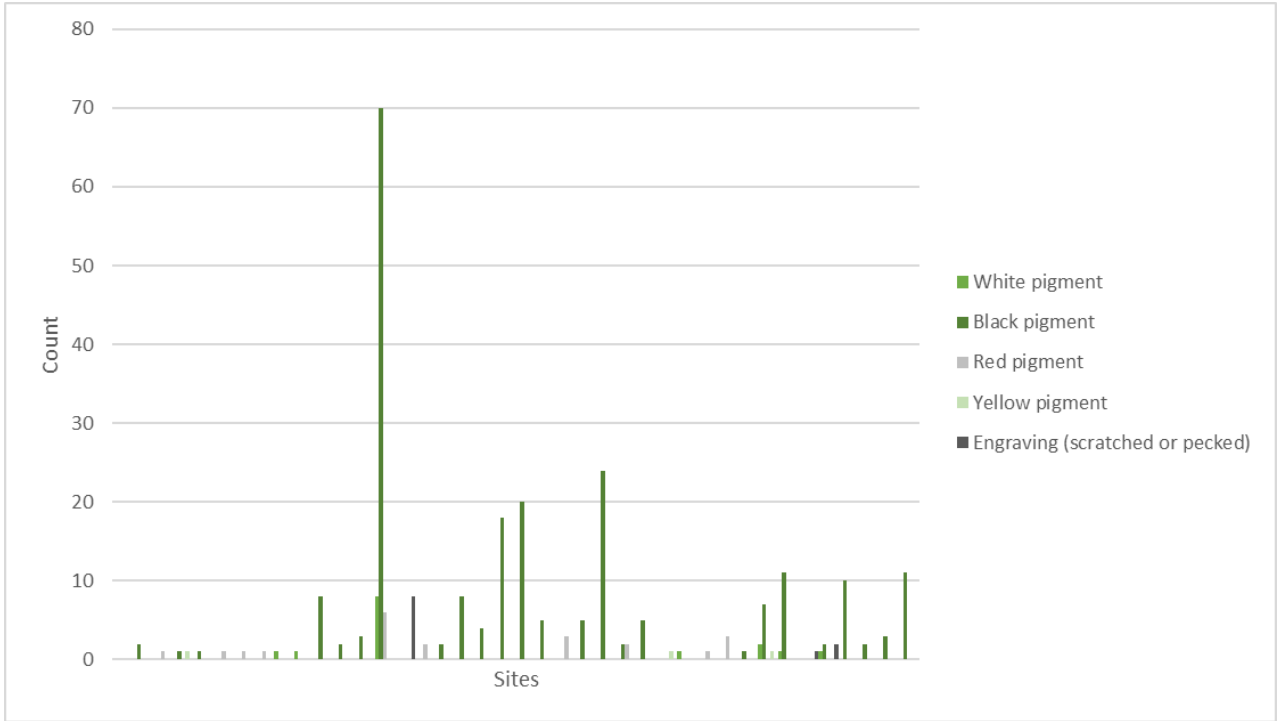
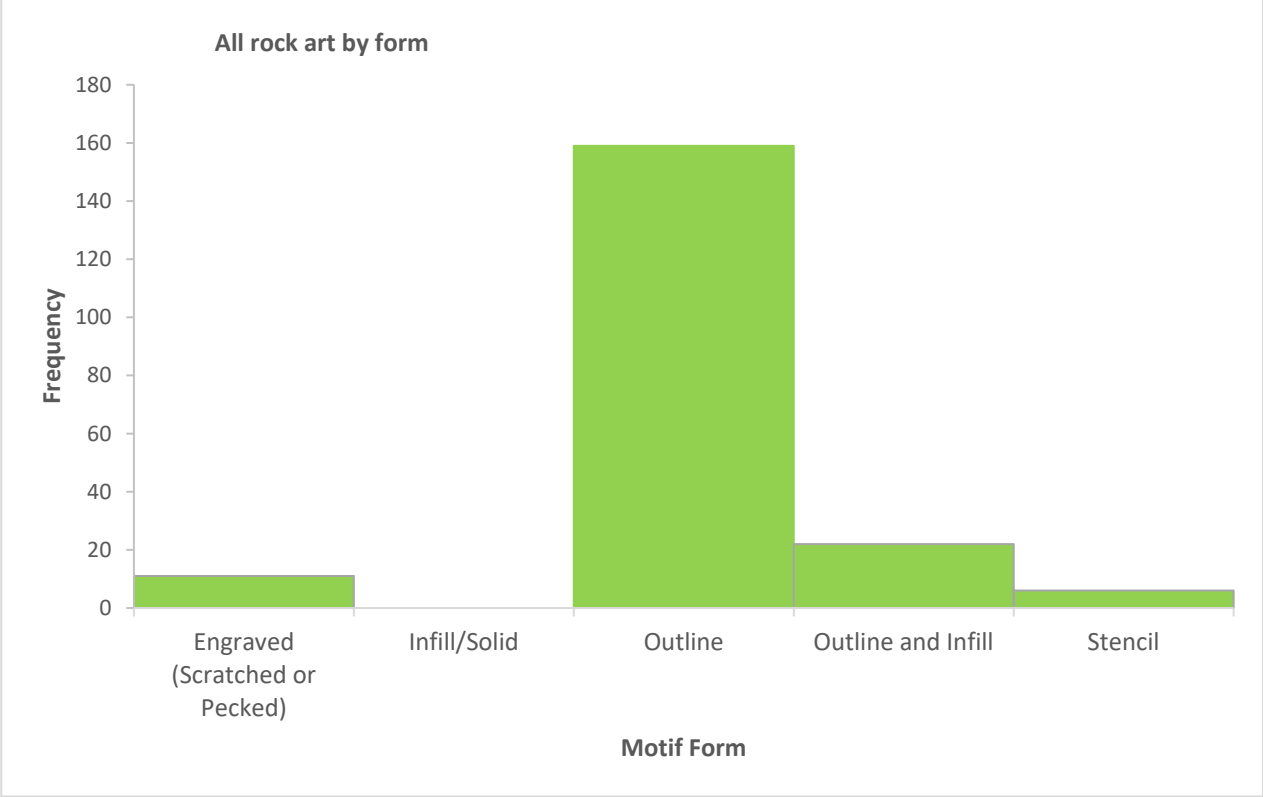


Chart 10 outlines the number of motifs by form as identified during the Warragamba assessment and highlights that outline motifs with no infill is the most common form of art application that is still present within the shelters of the Subject Area.

Chart 11: Number of motifs by form assessed during the Warragamba assessment



When looking at the motif by form at the desktop comparison sites outline is also the most common form of motif representation with a total of 399 of the 1867 motifs taking this form.

10.6.5 Engraving

Within the Subject Area there are no sites where engraving was identified as an application method this is further supported within the wider Gundungurra land by Smith who notes that 'The figurative outline carvings on rock, of animals and people, that are so characteristic of Dharug and Darkingung country, are extremely rare in Gundungurra land with only two sites recorded. These are the Bustard carving at Byrnes Creek in the Burragorang Valley and a Kangaroo head carving at Murruin (Stockton and Merriman, 2017:152).' It should be noted that neither of these sites fall with the Subject Area, or the areas used as part of the desktop rock art assessment.

10.6.6 Summary and discussion

Of the 334 sites identified within the Subject Area, 83 (25%) comprised rockshelter sites with various combinations of site features. Of these 83 sites, 34 (37%) comprised shelter sites where rock art was present (Table 16). Rock art sites form 10% of all sites across the Subject Area as a whole. Sites that illustrate multi-component art sites - indicative of multiple activities taking place at the site - are particularly well-represented. In contrast, sites exclusively associated with art are limited to a single shelter site with 8 indeterminate charcoal motifs.

Regionally, the Greater Blue Mountains area rock art falls into one of the three rock art forms established which were the Panaramitee, Complex Figurative and Simple Figurative (NSW National Parks and Wildlife

Service 1998: 162). The Panaramitee is a relatively homogenous engraving style across Australia that has been identified in some instances around the Greater Blue Mountains region. The art style mainly consists of engraved and pigment art styles that depict tracks and circles, in a geometric style (Plate 25).

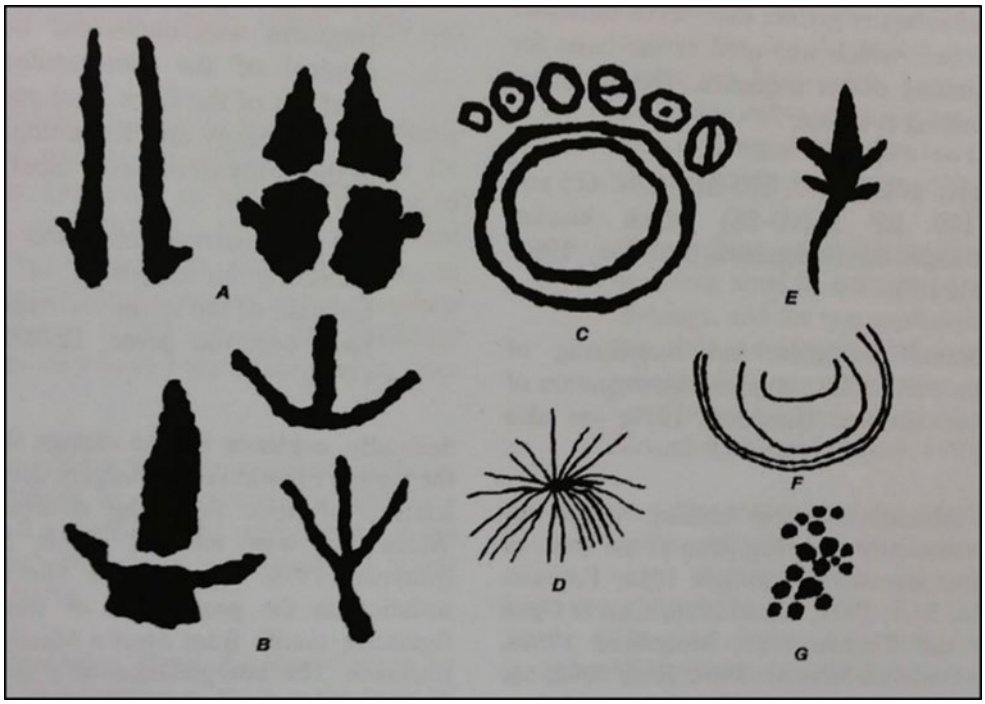


Plate 25: Example of the Panaramitee style (creativecommons)

Simple Figurative style is the predominate style found within the Greater Blue Mountains region (NPWS 1998:162). Tracks and figurative motifs dominate the art and whether a motif is engraved, drawn, or painted, in outline or solid form, it usually consists of a simple silhouette. Engravings are usually in outline, although some have infilled features (Plate 26). Pigment motifs range from outline to solid forms.

Plate 26: Example of the Simple Figurative style (creativecommons)

The Complex Figurative style is mainly located in Northern Australia, therefore it is not found in the region. The Complex Figurative style incorporates a variety of techniques to produce a drawing that contains multiple symbols, clothing, or actions such as dancing (McDonald 2008:44). This style features more detail rather than a simple outline (Plate 27).

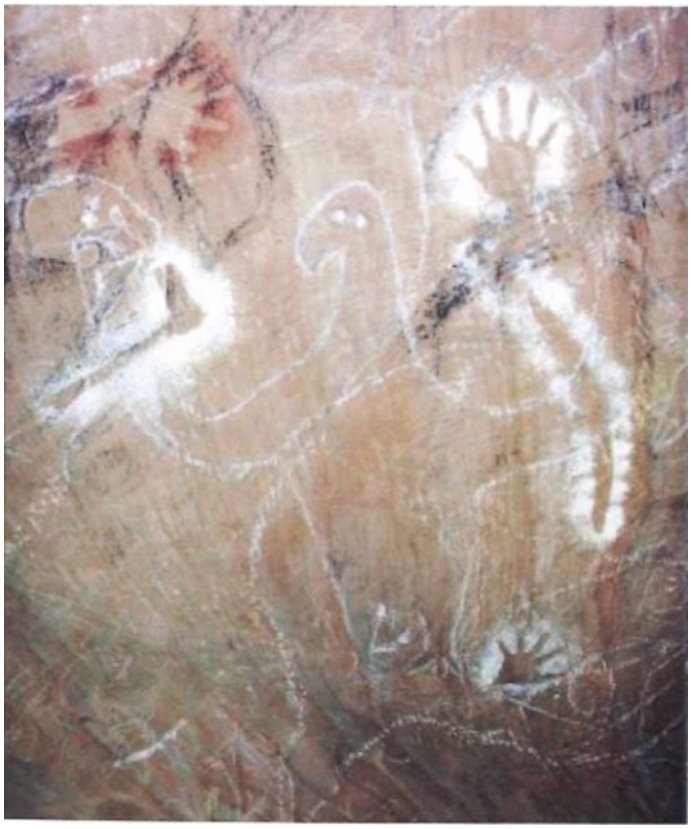


Plate 27: Example of the Complex Figurative Style, 'Eagle's Reach' at Wollemi (Stockton 1993:90)

It is important to note that considerably fewer engraved sites are located in the surrounding areas of the Project including the Blue Mountains National Park (NP), Kanangra-Boyd NP and Nattai NP (NPWS 1998:223). This contrasts the northern areas of the Greater Blue Mountains region where majority are located, particularly in Yengo NP. Comparative data previously used from Nattai NP provided important information about the anticipated number of shelters and art that would be present in the Subject Area. This allows a comparative analysis of the associated ages and stylistic differences of form and style as it is assumed Simple Figurative art components are relatively recent and roughly contemporaneous (NPWS 1998:168). Outlines and stencilling were the most common type of art in the Blue Mountains region, and hand outlines were one of the most reoccurring motifs found across the shelters in the region (NPWS 1998: 166). In relation to form within the Subject Area, motifs were mainly identified in the form of outlines numbering approximately 160 motif types. A large percentage of the types of motifs were indeterminate, preventing an accurate identification of the arts' subject (>70%) (Chart 9). Hand stencils were also one of the most commonly reoccurring outlines found across the shelters within the Subject Area, as depicted in Chart 9. The colours utilised in the art of the Blue Mountains region was predominately monochrome, and rarely incorporated more than one colour in the same painting. Chart 10 shows the variety of colours used across the motifs in the Project but does not show that multiple colours were used in the same painting.

The vast majority of pigment art sites regionally contain less than 30 motifs and sites with 10 motifs or less are common. This is also the case within the Subject Area, where only 1 site (Warragamba – 116) contained over 30 motifs. The average engraving site in the Blue Mountains region contains more than 10 motifs

whilst only a fifth of sites contain one motif only (NPWS 1998:164). This is depicted in Chart 11 which shows only a small number of engraved motifs across the Subject Area. A broad array of pigment motif types is found regionally, with anthropomorphic and zoomorphic figures being most common. This pattern is seen within the Subject Area with 55% of motifs being depictive, with the exception that complex non-figurative motifs comprise 7% of all motif types; 5.5% higher than observed across the broader region (McDonald 2008). Previous research on pigment art for the Blue Mountains and broader Sydney region has highlighted the importance of art sites containing a large number of culturally significant motifs, particularly those with evidence of superimposed images created over a long-time span of repeated visitation.

Previous research has indicated that such sites, or sites with over 100 motifs, form approximately 5% of all shelter art sites across the Sydney region. Warragamba-116 has over 100 motifs and application types demonstrating both drawn and stencils, with extensive layering of motifs indicative of intergenerational use. Shelters with floor deposit capable of yielding scientific information relating to occupation intensity and chronologies are common throughout the Sydney region generally, forming approximately 50% of sites in many locations (McDonald 2008). Shelters with deposit are particularly common within the Subject Area (74%).

In analysing the rock art motif forms and application as assessed during the Project assessment to those sites that were assessed off their AHIMS site recordings it can be concluded that the motifs and application within the Subject Area is as expected based on the comparative data, given that they comprise of two charcoal indeterminate lines. With charcoal and outline expression being the most dominate art type in the region including the Subject Area. As there was such a low number of shelter sites with readily recognisable motifs due to insufficient panels for such expression, natural weathering processes or the site being located within the EUIA or below the FSL of Lake Burragorang. It is difficult to determine whether art would have been a more prevalent expression of cultural use of the shelters within the region in the past by Aboriginal people. Of these rock art sites, only one site resides within the impact area, minimising the extent to which these sites will be harmed.

10.7 Stone Arrangement Sites

There was one potential stone arrangement site (Warragamba-80 AHIMS ID# pending) identified within the Subject Area, within a location that has been heavily disturbed due to agricultural practices. Often stone arrangements have been associated with ceremonial grounds. Though the general locations of some ceremonial grounds occur within historical documentation, there have been no places where ceremonies have taken place in the past, that have been identified based on stone cairns. 'In the lower Blue Mountains, present-day Darug community members have identified many stone cairns which they believe were associated with ceremonial activities or directional markers (Attenbrow 2002: 134).' At Warragamba-80 (AHIMS ID# pending) it is difficult to determine whether the stone arrangement is of Aboriginal origin due to the disturbed nature of its context and the remains that were visible due to vegetation coverage at the time of assessment.

10.8 Water Hole Sites

There were three Water Hole site recording as part of the assessment. As outlined previously in Section 9.2.2 these were each recorded in conjunction with limestone deposits (Morle Bloc) that have been interpreted to be used for medicinal purposes. Water Holes within Lake Burragorang have also been associated with the creation story as highlighted in the CVAR and with past Aboriginal stone tool development and resource gathering practices.

10.9 Summary

The Subject Area contains a range of archaeological and cultural sites which provide information about past Aboriginal land use and settlement of the area. The types and locations of sites can be interpreted to provide an insight into what events took place in the past, and how the landscape was used in the past.

The sites present represent a range of activities and events, such as living places, stone artefact manufacture, the grinding of stone axes, the use of flaked stone artefacts to prepare foods and utilitarian items, the grinding of plant foods to produce flour and the removal of bark and cambium from trees for utilitarian items such as shelters and coolamon style dishes. Justine Coplin of the Darug people's further states that:

'*While people were living the traditional lifestyle song, dance, art and ceremony was and is a big part of daily life. People read the land and signs similar to reading maps today. There were signs left in the landscape showing tribal areas, ceremonial places, sacred places, burials, women's places, and resources. The Warragamba Dam area contains evidence of these ceremonial places, sacred places, women's places, and resource area that have been recorded during the project. '*

The location of the sites in the Subject Area are dependant in many cases on the natural environment – grinding grooves only occur where there are suitable stone platform outcrops, and sandstone shelters only occur in areas where there are suitable rock formations, which generally occur on moderate and steeply inclined slopes. However, within this framework of the landscape Aboriginal people will have used the land in different ways, at different times and for different purposes – dictated by both utilitarian and non-utilitarian influences and objectives. Resource rich areas such as creeks, and rivers may have been a focus of occupation when resources were abundant or readily available, and hence we expect to find more archaeological sites in association with these landforms. On the other hand, the nature and timing of occupation will also have been dictated by non-utilitarian objectives such as ceremonies, rituals, and gatherings. Potential for sub-surface deposits is also evident at open sites and sandstone shelters. Out of the 43 Aboriginal cultural heritage sites, there are eight shelters within the PUIA that have subsurface potential. Open sites within the PUIA also possess sub-surface potential however it is noted that the soil profile is general shallow and skeletal in nature. Nonetheless, a test excavation will be required to further investigate the nature of Aboriginal occupation within the Subject Area.

In conclusion, the archaeological and cultural values work that has been undertaken for the Project provides an insight into past Aboriginal land use within the Subject Area and the wider region. Some of the largest archaeological sites identified are located in close proximity to the Lake Burragorang, which would have provided abundant and reliable resources.

10.10 Re-evaluation of the Predictive Model

A predictive model was presented in Section 7. Following the survey, the predictive model was re-evaluated and is presented below in Table 48. The following points identify the key finds of the comparison with the original predictive model:

- As the table below outlines artefact sites as predicted (Open Camp Sites and Isolated Stone artefacts) were the most prevalent number of site type identified during the assessment.
- Shelter sites were more prevalent on very steep slopes, which differed from the predictive model due to the formation of shelters in the Narrabeen sandstone ridgeline formations. Further to this sandstone shelters were the second most comment site type, not scarred trees as initially predicted.
- As predicted Axe Grinding Groove and Water Hole sites were difficult to identify due to the water and sediment levels within the Warragamba Dam currently.

- There were no burials identified during the assessment.

Table 48: Comparison and Revisions to the Archaeological Model for the Project

Predictive Statements	Survey Results (This Assessment)
Stone artefact scatters and isolated stone artefacts are the most common class of site type or feature within the Subject Area:	Open Camp Sites are the most prevalent site type with 207 discovered, accounting for 61.98% of sites surveyed. Artefact Scatters were present as a feature at 73.81% of sites.
The identification of this type of site depends on ground surface visibility, as site extent and artefact numbers are only visible on the surface. Due to the vegetation cover of the Subject Area this type of site type may be difficult to relocate. Areas of open ground surface will be assessed for such site types.	During this survey many artefacts were in areas of disturbance. These areas include the eroded shore of the stored water, the dripline of shelters, and other types of disturbance such as wombat holes. These areas were assessed to gain an understanding of adjacent areas with vegetation cover which are on the same landform. This method of re-location was successful in obtaining indicative samples of the density of artefacts scatters, given the continual erosion and movement of surface deposits occurring across the flooding impact zone.
Most of these types of site occur on level to gently inclined alluvial plains, floodplains, terraces, foot slopes, simple slopes, ridges, and crests.	These landform elements where most sites are located were Moderate, followed by Gently Inclined slope classes. It was more likely that sites were to be found on Steep slope classes than Flat, and just as likely that sites were found on Very Steep terrain as Flat or Gently inclined slope classes. It was more likely that Open Camp Sites were in more level sloping terrain. In the case of Rockshelter sites, these were in areas of steep sloping terrain at a greater frequency than predicted. It is also unlikely that surface scatters would remain on steeper landforms, and there were no artefact scatters found on this terrain type that were not also associated with Rockshelters.
The majority of sites will occur within 200m of temporary or permanent water sources.	The majority of sites located as part of this survey were located within the flooding impact area. All sites in this area are within 200m of a temporary or permanent water source.
The majority of sites will occur on alluvial and transferral soil landscapes, which are present within the Subject Area.	While the Subject Area contains alluvial soil landscapes, these only accounted for 2.08% of sites found. Most sites were found in colluvial soil landscapes (41.96% of sites) with the second most frequent category being erosional soil landscapes (40.18% of sites). Four sites were located in transferral soil landscapes. There were a substantial percentage of sites (13.99% of sites) which were indicated as below the Full Supply Level (soil landscape affected by water).
Scarred Trees are the second most likely represented class of site type in the Subject Area, accounting for 11% of registered sites:	The second most likely site type was Shelter Sites, not Scarred Trees. The ratio of scarred trees located was less than expected, and only 1.79% of sites had this feature. Sites consisting of only Scarred Trees accounted for only 1.49% of sites.
Scarred trees are a site type that is formed from the removal of bark from a tree for use in the manufacture of canoes, shields, shelters and containers for sorting or carrying items.	The most common type of scarred trees had bark removed in a size which indicates use for Coolamons (containers for sorting or carrying items) but were not large enough for the manufacture of canoes or shields.
The majority of the Subject Area has been protected from large scale timber felling operations due to its use as a water catchment area, significantly increasing the likelihood of survival of this site type.	Large scale timber operations were carried out as part of the building of the Warragamba Dam, and yet culturally modified trees were found in areas which were already cleared as part of the Dam's creation. It is unclear whether these were created during the logging process as markers by Aboriginal members of the logging crews, or if they were deliberately not logged when the valley was flooded due to their cultural significance. Scarred Trees were found in areas not yet subject to large scale timber felling, however it is unclear if the restriction on logging in the post dam era has increased the survival of this site type to a significant degree.

Predictive Statements	Survey Results (This Assessment)
	There are several other threats to Scarred Tree sites such as bushfires which are not reduced in severity by the restriction on logging.
Grinding groove sites are one of the most common site type within the area, making up approximately 5% of the AHIMS registered site numbers:	Sites containing only Axe Grinding Grooves accounted for 2.38% of sites surveyed, however as a feature they were more frequent, with 12.50% of sites having related Axe Grinding Groove.
Axe grinding groove sites will most likely occur on sandstone outcrops associated with drainage lines, swamps, creek lines and riverbeds.	Axe grinding grooves were more commonly associated with shelter sites, with only eight sites out of 42 sites containing this feature not associated with a shelter. Some of the Axe Grinding Grooves were on detached sandstone boulders.
The bulk of grinding groove sites will contain fewer than 50 grinding grooves.	Most sites of this type did not contain above 50 grooves, with under 10 grooves per site the most common distribution.
Grooves will generally be between 25 cm and 50 cm in length, 5 cm to 8 cm in width and between 2 cm and 5 cm in depth and represent the sharpening or preparing of ground edge hatchets or fire hardened points.	Most grooves found fit the predicted dimensions, however many grooves were shallower than expected, and were often found weathered by inundation by the stored water at Full Supply Levels, or by water wash from run-off. Most grooves were associated with ground edge hatchets in the accompanying artefacts scatter, as only eight sites which contained grooves did not also have artefacts as well.
Although not previously recorded in high numbers, sandstone shelters or rock overhangs with archaeological deposits, art, midden and/or artefacts will be one of the most common sites identified within the Subject Area. The geological characteristics of the Subject Area are consistent with those required for sandstone shelters.	There were many Shelter sites, with 83 located, accounting for 25% of sites surveyed. These types of sites were more commonly associated with steeper slopes and ridgelines, in contrast to other site types such as Open Camp Sites.
There is a potential for Waterholes to be present within the Subject Area. This site type was not only a critical resource within the environment but played a significant role in ceremonies and as a place for the community to meet and pass down stories from one generation to another.	There were three Water Hole sites located in the Survey Area, accounting for only 0.89% of sites. The location of many of these sites is difficult to establish since the flooding of the Warragamba valley during the building of the dam. This is primarily due to the fact that these sites would have been associated with river systems which have since been inundated by the stored water. The low frequency of these sites, therefore, is not indicative of their significance, and their impact on and use in cultural practises is difficult to re-assess.
Rock engravings may be present within the Subject Area due to the sandstone present within proximity to water. Rock engravings consisting of carefully drawn images of people, animals, or symbols, in the sandstone.	There were no sites containing rock engravings found in the Subject Area. There was one AHIMS site which recorded an engraving as present within the survey area, however this could not be re-located during this survey. This was predominately because the location was not recorded on this site card with accuracy, and the probable location was found to be inundated at the time of the building of Warragamba Dam.
Burials, an uncommon site type, are present within soft alluvial sediments, caves, or hollow trees. Such sites are more commonly located within the sand dunes of the coastal region. It is highly unlikely that this site type will occur within the Subject Area.	There were no human burials identified within the Subject Area. There was some evidence of animal remains in the soft mud which exists at the edge of the stored water, but this was not indicative of any human activity.
Stone arrangements are rare in the local area. This type of site can include mounds of rocks for burial, or markers, mythological sites, or areas of spiritual connection. There are no stone arrangements previously identified within the Subject Area.	While there was some indication of stone arrangements, with evidence for two sites found, this remains a rare site type, making up only 0.60% of site types found.
Ceremonial grounds, these are sites where initiation ceremonies, marriage alliance ceremonies, tribal meetings, and other important social functions were	There was one site identified as being associated with Aboriginal ceremony and dreaming in the Survey Area, a rarer site type made up 0.30% of all sites surveyed during this survey. It should be noted that

Predictive Statements	Survey Results (This Assessment)
held. They are places of great significance to Aboriginal people. There are no Ceremonial grounds previously identified in AHIMS within the Subject Area.	this site is a contributory element to a larger storyline, which forms part of the nomination for an Aboriginal Place (see below).
Aboriginal places are places of cultural significance to Aboriginal people. No Aboriginal places have been declared within the Subject Area (February 2018) or listed on AHIMS.	While no Aboriginal Places have been declared in the Subject Area, there is a current nomination for creation of an Aboriginal Place for the entirety of the Burragorang Valley. Please see Section 4.4 for further information.

10.10.1 Archaeological landscape predictions

The survey results were analysed with reference to the soil landscapes to enable a prediction of the total number of sites likely to occur within the EUIA, Subject Area (PUIA) and outside the Subject Area areas. The survey results used for the predictive analysis were the results in their entirety, comprising the results from within and beyond the subject area (see Section 9.1). The predictive analysis was based on extrapolating the results of the survey across the entirety of the EUIA, PUIA and Above PUIA by defining a ratio of hectares per site, as summarised in Table 49. The analysis was constrained to open sites and rockshelter sites only, as there were not enough representative numbers of other sites (such as scarred trees, for example) to make predictions at this landscape level. Nevertheless, the less frequently recorded sites should be expected to occur in proportionate numbers across the Project area.

Table 49: Sites recorded in each soil landscape and ratio of number of hectares for each site

Soil Landscape	Open sites (artefacts, grinding grooves, multiple features)	Rockshelters site (art, grinding grooves, artefacts, multiple features)	Area Surveyed (ha)	Soil Landscape ha per open site	Soil Landscape ha per rockshelter site
Barralier	0	0	0.00	0	0
Cedar Valley	11	6	213.54	19.41	35.59
Coxs River	2	0	31.63	15.82	0.00
Emu Island	1	0	99.30	99.30	0.00
Faulconbridge	0	0	4.26	0.00	0.00
Gymea	0	0	0.00	0.00	0.00
Hassans Walls	57	5	385.65	6.77	77.13
Hawkesbury	0	3	38.13	0.00	12.71
Horse Flat	0	0	17.95	0.00	0.00
Jooriland Range	10	1	187.00	18.70	187.00
Kanangra Gorge	10	5	100.02	10.00	20.00
Kedumba	20	7	283.80	14.19	40.54
Martins Flat	16	3	230.40	14.40	76.80
Martins Flat variant a	24	2	324.26	13.51	162.13
Round Mount	17	8	93.42	5.50	11.68
Warragamba	0	4	51.74	0.00	12.93
Water (below FSL)**	30	7	547.70	18.26	78.24
Wollondilly River	1	0	45.30	45.30	0.00
Total*			2654.1		

** This is the total area surveyed during the project field assessment, including areas outside of the PUIA, EUIA and Above PUIA*

*** The soil mapping for the area includes large areas simply mapped as "Water", usually these areas are below FSL but it does include parts of the EUIA and PUIA*

The results of the predictive analysis results are broken down for the Subject Area and outside the Subject Area and are presented in Table 50.

Table 50: Archaeological landscape predictive analysis and Subject Area and EUIA.

	Outside of Subject Area		Subject Area			
	EUIA[1]		PUIA		Above PUIA	
Soil Landscape	**Open sites**	**Rockshelters**	**Open sites**	**Rockshelters**	**Open sites**	**Rockshelters**
Barralier	*0*	*0*	*0*	*0*	*0*	*0*
Cedar Valley	*5*	*3*	*7*	*6*	*20*	*11*
Coxs River	*0*	*0*	*2*	*0*	*13*	*0*
Emu Island	*4*	*0*	*0*	*0*	*0*	*0*
Faulconbridge	*0*	*0*	*0*	*0*	*0*	*0*
Gymea	*0*	*0*	*0*	*0*	*0*	*0*
Hassans Walls	*34*	*3*	*41*	*5*	*89*	*8*
Hawkesbury	*0*	*0*	*0*	*3*	*0*	*1*
Horse Flat	*0*	*0*	*0*	*0*	*0*	*0*
Jooriland Range	*1*	*0*	*3*	*1*	*13*	*1*
Kanangra Gorge	*9*	*4*	*13*	*5*	*47*	*23*
Kedumba	*7*	*2*	*12*	*7*	*24*	*8*
Martins Flat	*7*	*1*	*14*	*3*	*28*	*5*
Martins Flat variant a	*7*	*1*	*13*	*2*	*25*	*2*
Round Mount	*6*	*3*	*8*	*8*	*20*	*9*
Warragamba	*0*	*4*	*0*	*4*	*0*	*9*
Water[2]	*377*	*88*	*2*	*7*	*3*	*1*
Wollondilly River	*1*	*0*	*2*	*0*	*4*	*0*
Summary:	***EUIA***		***PUIA***		***Above PUIA***	
Total (includes known sites)[3]	458	109	117	51	285	80
Other known archaeological site types	11		6		5	
Archaeological site prediction for area (includes known sites)	**578**		**174**		**370**	

[1] This prediction includes the area below FSL, hence the large number of predicted sites

[2] This is because the soil mapping for the area has some areas within the PUIA mapped as "Water"

[3] The model generates decimal numbers and these figures and those above have been rounded from the original results

Based on the predictive landscape model of soil landscape site distribution the PUIA is predicted to contain a total of 174 archaeological sites, comprised of 117 open sites with stone artefacts and 51 rockshelter sites. The EUIA is predicted to contain 578 archaeological sites, again comprising mostly of open sites, at a predicted 458 open sites and 109 rockshelter sites. The EUIA prediction is influenced by two important factors: high visibility below FSL resulting in a high number of known sites, and the inclusion of the soil landscape mapped as "water" which extrapolates the results over a very large area. This is not seen as a constraint to the assessment, as all areas of the EUIA below the FSL are impacted regardless of the Project. Above the PUIA, in the zone of very low risk from the project, there are predicted to be 370 archaeological sites, with slightly lower proportional representation of rockshelters compared to open sites.

In addition to the open sites and rockshelters all of the areas may also contain, in similar proportions to their known site occurrence, scarred trees, waterholes, resource and gathering and ceremony and dreaming sites (see also the Project CVA).

11. Scientific values and significance assessment

11.1 Assessment framework

The Burra Charter (Australia ICOMOS 2013) defines the basic principles and procedures to be observed in the conservation of important heritage places. It provides a primary and 'best-practice' framework within which decisions about the management of heritage sites in Australia should be made. The Burra Charter and the OEH policy Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW (OEH 2011) define cultural significance as being derived from the four values presented in Table 51.

Table 51: Scientific values as outlined by the Burra Charter

Value type	Description
Aesthetic Value	Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.
Historic Value	Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.
Scientific Value	The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information.
Social Value	Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group.

11.2 Grading Values and Significance

The following gradations, where a site or zone satisfies at least one criterion, have been applied to provide a measure of the values/significance for Aboriginal objects identified within the Subject Area, and to provide an overall assessment of the significance of each of the zones used that define the Subject Area.

Table 52: Grades of values and significance

Grade of value	Description of grade
Low	The site or object contains only a single or limited number of features, and has no potential to meaningfully inform our understanding of the past beyond what it contributes through its recording (i.e. no or low research potential). The site or object is a representative but unexceptional example of the most common class of sites or objects in the region. Many more similar examples can be confidently predicted to occur within the Subject Area, and in the region.
Moderate	The site or object derives value because it contains features, both archaeological and contextual, which through further investigation may contribute to our understanding of the local past. These features include, but are not limited to: the relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a relatively large assemblage of stone artefacts. The presence of a diverse artefact and feature assemblage, and connectedness with landscape features and other notable sites provide relatively higher representative and rarity values than sites of low significance.

Grade of value	Description of grade
High	The site or object has value because it contains archaeological and/or contextual features which through further investigation may significantly contribute to our understanding of the past, both locally and on a regional scale. These features include, but are not limited to: Aboriginal ancestral remains; the site's relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a very large assemblage of stone artefacts associated with other features such as oven remains or shell midden. Such sites will be relatively rare, and will be representative of a limited number of similar sites that make up this class; hence they derive high representative and rarity values.

11.3 Scientific (Archaeological) Significance Assessment of Aboriginal Heritage Sites

The categorisation into aesthetic, historic, scientific and social values is one approach to understanding the concept of cultural significance. However, more precise categories may be developed as an understanding of a particular place or site increases.

The NSW Aboriginal cultural heritage regulatory framework supports the significance assessment of Aboriginal archaeological sites and provides guidelines within the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011). The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) outlines two main themes in the overall Aboriginal cultural heritage significance assessment process, namely, the identification of the cultural/social significance of Aboriginal objects and/or places to Aboriginal people and the identification of the scientific (archaeological) significance to the scientific/research community. These themes encapsulate those aspects of the Burra Charter that are of particular relevance to Aboriginal objects and places.

The Guidelines specify that information about scientific values will be gathered through archaeological investigation carried out according to the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b). The *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) itself does not specify criteria for assessment of Aboriginal objects, but rather suggests to "identify the archaeological values and assess their significance." The assessment must be supportable, and the assessment criteria must reflect best practice assessment processes as set out in the Burra Charter.

Notwithstanding the circularity of this advice, the scientific values described in the Burra Charter (Section 11.1) were considered further by the then *NSW National Parks and Wildlife Service in their Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997).

In lieu of specific criteria, the advice from the Aboriginal Cultural Heritage Standards and Guidelines Kit (DEC 1997) is summarised and paraphrased below to provide guidance to the assessment of scientific values.

Table 53: Criteria specified for archaeological significance

Criteria	Description
Research potential	It is the potential to elucidate past behaviour which gives significance under this criterion rather than the potential to yield collections of artefacts. Matters considered under this criterion include – the intactness of a site, the potential for the site to build a chronology and the connectedness of the site to other sites in the archaeological landscape.
Representativeness	As a criterion, representativeness is only meaningful in relation to a conservation objective. Presumably all sites are representative of those in their class or they would not be in that class. What is at issue is the extent to which a class of sites is conserved and whether the

Criteria	Description
	site being assessed should be conserved to ensure that we retain a representative sample of the archaeological record. The conservation objective which underwrites the 'representativeness' criteria is that such a sample should be conserved.
Rarity	This criterion cannot easily be separated from that of representativeness. If a site is 'distinctive' then it will, by definition, be part of the variability which a representative sample would represent. The criteria might best be approached as one which exists within the criteria of representativeness, giving a particular weighting to certain classes of site. The main requirement for being able to assess rarity will be to know what is common and what is unusual in the site record but also the way that archaeology confers prestige on certain sites because of their ability to provide certain information. The criterion of rarity may be assessed at a range of levels: local, regional, state, national, and global.
Educational Potential	Heritage sites and areas should be conserved and managed in relation to their value to people. It is assumed that archaeologists have the ability to speak of the value of sites to members of their own profession. Where archaeologists or others carrying out assessments are speaking for the educational value of sites to the public, the onus is on them to go to the public for an assessment of this value, or to reputable studies which have canvassed public demand for education. The danger, otherwise, is that archaeologists would be projecting their values onto a public which is itself given no voice on the matter.
Aesthetics	Archaeologists are not expected to include an assessment of aesthetic significance along with their assessment of scientific significance. In relation to heritage places, aesthetic significance is generally taken to mean the visual beauty of the place. Aesthetic value is not inherent in a place but arises in the sensory response people have to it. Although the guidelines provide no expectation for archaeologists to consider aesthetic values it is often the case that a site's or a landscape's aesthetic is a significant contributory value to significance. Examples of archaeological sites that may have high aesthetic values would be rock art sites, or sites located in environments that evoke strong sensory responses. For this reason, we consider it appropriate to include aesthetic values as part of the significance assessments for the sites identified during this assessment.

Further to the criteria outlined above for the scientific significance for the sites identified during this assessment the number of objects/and or art motif type and number and diversity of motifs was considered in the determination of significance for each site. This is further outlined in Annex 4 and Annex 5.

Further to the guidelines outlined above scientific (archaeological) significance was also determined by evaluating the research potential of each Aboriginal cultural heritage site, and what the artefacts, or Potential Archaeological Deposit (PAD), art assemblage or other archaeological features could potentially indicate to future researchers with regard to how Aboriginal people lived within the landscape of Lake Burragorang.

Isolated Artefacts, individual or low numbers of axe grinding grooves and instances where art was charcoal indeterminate and where the artefacts, features or art had no distinctiveness or uniqueness, were given a low scientific (archaeological) significance rating due to the limitation of further scientific information being gleaned from these sites.

Aboriginal cultural heritage sites comprising of high numbers of axe grinding grooves, artefacts in high numbers and densities and assemblages of art with high numbers of well-preserved motifs and/or a diversity of motifs, media and application techniques were given a moderate to high scientific (archaeological) significance rating due to the ability of future research to be carried out in regard to artefact development and site use over time. Likewise, sites that comprised of multiple site features (a shelter with art, deposit and grinding grooves, for example) and characteristics such as shelters with undisturbed deposit, high density artefact scatters, axe grinding grooves and art that has been layered indicating extended use of the site over a longer period of time, that has also been well preserved through environmental processes were also given a high (archaeological) significance assessment due to the further understanding they would provide to future researchers. It should be noted that in some cases, such as a hatchet with hafting resin still present, or an artefact with distinctive use-wear, or a particularly unique art motif individual or isolated features can be of high or moderate scientific significance.

There were no observations or finds made at any previously recorded sites that would alter their previously determined significance.

Educational potential and aesthetic values are not considered to be criteria against which scientific values and significance can be assessed. Aesthetic values should be considered as a distinct category (rather than a criterion that contributes to scientific value) in accordance with the Burra Charter and the Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW (OEH 2011). Educational potential is a criterion that contributes to social value, rather than scientific value, and hence this is considered in the overall cultural significance assessment and CVAR.

Table 54: Scientific significance ratings of Aboriginal cultural heritage sites identified

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
45-4-0186	Policeman's Point	Shelter with Deposit, Artefacts and Axe Grinding Grooves	High	High
45-4-0187	Kedumba; Kedumba Crossing	Open Camp Site	High	High
45-4-0191	Grahams Landing	Open Camp Site	High	High
45-4-0930	CA 1; Warragamba Dam Special Area	Open Camp Site	High	High
45-4-0931	EH 1; Warragamba Special Area	Open Camp Site	High	High
45-4-0946	TR 1	Open Camp Site	High	High
45-4-0948	GW5	Open Camp Site	High	High
45-4-0966	Ashtons 1	Axe Grinding Grooves	High	High
45-4-0967	RC1	Open Camp Site	High	High
45-4-0983	JUNCTION POINT 1	Open Camp Site	High	High
45-4-0997	Bimlow PAD	Shelter with Art, Axe Grinding Grooves, and Artefacts	High	High
52-1-0045	Jooriland Creek, Upper Burragorang	Axe Grinding Grooves	High	High
52-1-0126	Little River 1	Open Camp Site	Low	High
52-1-0127	Little River 2	Open Camp Site	Low	High
52-1-0128	Little River 3	Open Camp Site	High	High
52-1-0130	Tonalli Cove 1	Open Camp Site	High	High
52-1-0131	Tonalli Cove 2	Scarred Tree	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
52-1-0133	Tonalli Cove 4	Open Camp Site	High	High
52-1-0136	Green Wattle Point	Open Camp Site	High	High
52-1-0141	Upper Wollondilly 2	Open Camp Site	High	High
52-1-0142	Kamilaroi Point	Shelter with Art and Deposit	High	High
52-1-0168	Joorilands Farm 1	Open Camp Site with Scarred Tree	High	High
52-1-0170	Joorilands Farm 2	Open Camp Site with Axe Grinding Grooves and Scarred Tree	High	High
52-1-0171	Joorilands Farm 3	Scarred Tree	High	High
52-1-0178	MF1	Shelter with Deposit	Low	High
52-1-0186	W223, Byrnes Creek	Open Camp Site	High	High
52-1-0236	Burra Lake Flake 1	Open Camp Site	High	High
52-1-0332	Byrnes Bay OS-1	Open Camp Site	High	High
52-1-0345	Green Wattle Point OS-1	Open Camp Site	High	High
52-1-0346	Joorilands OS-1	Open Camp Site	High	High
52-1-0352	Tonalli OS-1	Open Camp Site	High	High
Pending	Warragamba-00	Open Camp Site	Low	High
Pending	Warragamba-01	Open Camp Site	Low	High
Pending	Warragamba-02	Open Camp Site	Low	High
Pending	Warragamba-03	Open Camp Site	Low	High
Pending	Warragamba-05	Aboriginal Resource and Gathering	Low	High
Pending	Warragamba-06	Open Camp Site	Low	High
Pending	Warragamba-07	Open Camp Site	Low	High
Pending	Warragamba-08	Open Camp Site	Low	High
Pending	Warragamba-09	Open Camp Site	Low	High
Pending	Warragamba-10	Shelter with Deposit	Moderate	High
Pending	Warragamba-11	Shelter with Deposit	Low	High
Pending	Warragamba-12	Open Camp Site	Low	High
Pending	Warragamba-13	Isolated Artefact	Low	High
Pending	Warragamba-14	Open Camp Site	Low	High
Pending	Warragamba-15	Open Camp Site	Moderate	High
Pending	Warragamba-16	Shelter with Art and Artefacts	Low	High
Pending	Warragamba-17	Open Camp Site	Low	High
Pending	Warragamba-18	Open Camp Site	Low	High
Pending	Warragamba-19	Open Camp Site	Low	High
Pending	Warragamba-20	Open Camp Site	Low	High
Pending	Warragamba-21	Open Camp Site	Low	High
Pending	Warragamba-22	Open Camp Site	Moderate	High
Pending	Warragamba-23	Open Camp Site	Low	High
Pending	Warragamba-24	Open Camp Site	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-25	Open Camp Site	Low	High
Pending	Warragamba-26	Open Camp Site	Low	High
Pending	Warragamba-27	Open Camp Site	Low	High
Pending	Warragamba-28	Open Camp Site	Low	High
Pending	Warragamba-29	Open Camp Site	Low	High
Pending	Warragamba-30	Open Camp Site	Low	High
Pending	Warragamba-31	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-32	Open Camp Site	Low	High
Pending	Warragamba-33	Open Camp Site	Low	High
Pending	Warragamba-34	Open Camp Site	Low	High
Pending	Warragamba-35	Open Camp Site	Low	High
Pending	Warragamba-36	Open Camp Site	Low	High
Pending	Warragamba-37	Open Camp Site	Low	High
Pending	Warragamba-38	Open Camp Site	Moderate	High
Pending	Warragamba-39	Open Camp Site	High	High
Pending	Warragamba-40	Open Camp Site	High	High
Pending	Warragamba-41	Open Camp Site	Low	High
Pending	Warragamba-42	Open Camp Site	Low	High
Pending	Warragamba-43	Open Camp Site	Low	High
Pending	Warragamba-44	Open Camp Site	Low	High
Pending	Warragamba-45	Open Camp Site	Low	High
Pending	Warragamba-46	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-47	Open Camp Site	Low	High
Pending	Warragamba-48	Open Camp Site	High	High
Pending	Warragamba-49	Open Camp Site	Low	High
Pending	Warragamba-50	Open Camp Site	Low	High
Pending	Warragamba-51	Open Camp Site	Low	High
Pending	Warragamba-52	Open Camp Site	Low	High
Pending	Warragamba-53	Open Camp Site	Low	High
Pending	Warragamba-54	Open Camp Site	Low	High
Pending	Warragamba-55	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-56	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-57	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-58	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-59	Open Camp Site	Low	High
Pending	Warragamba-60	Shelter with Art and Deposit	Low	High
Pending	Warragamba-61	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-62	Shelter with Art and Deposit and Artefacts	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-63	Water hole	Moderate	High
Pending	Warragamba-64	Isolated Artefact	Low	High
Pending	Warragamba-65	Open Camp Site	Low	High
Pending	Warragamba-66	Open Camp Site	Low	High
Pending	Warragamba-67	Open Camp Site	Low	High
Pending	Warragamba-68	Open Camp Site	Low	High
Pending	Warragamba-69	Open Camp Site	Low	High
Pending	Warragamba-70	Open Camp Site	Low	High
Pending	Warragamba-71	Open Camp Site	Low	High
Pending	Warragamba-72	Open Camp Site	Low	High
Pending	Warragamba-73	Isolated Artefact	Low	High
Pending	Warragamba-74	Water hole and Aboriginal Ceremony and Dreaming	High	High
Pending	Warragamba-75	Aboriginal Resource and Gathering	High	High
Pending	Warragamba-76	Scarred Tree	Low	High
Pending	Warragamba-77	Isolated Artefact	Low	High
Pending	Warragamba-78	Isolated Artefact	Low	High
Pending	Warragamba-79	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-80	Stone Arrangement	Low	High
Pending	Warragamba-81	Open Camp Site	Low	High
Pending	Warragamba-82	Open Camp Site	Low	High
Pending	Warragamba-83	Axe Grinding Grooves	Low	High
Pending	Warragamba-84	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-85	Open Camp Site	Low	High
Pending	Warragamba-86	Open Camp Site	Low	High
Pending	Warragamba-88	Isolated Artefact	Moderate	High
Pending	Warragamba-89	Open Camp Site	Low	High
Pending	Warragamba-90	Isolated Artefact	Low	High
Pending	Warragamba-91	Scarred Tree	Low	High
Pending	Warragamba-92	Stone Arrangement	Low	High
Pending	Warragamba-93	Open Camp Site	Low	High
Pending	Warragamba-94	Open Camp Site	Moderate	High
Pending	Warragamba-95	Open Camp Site	Low	High
Pending	Warragamba-96	Open Camp Site	Low	High
Pending	Warragamba-97	Open Camp Site	Low	High
Pending	Warragamba-98	Open Camp Site	Low	High
Pending	Warragamba-99	Open Camp Site	Low	High
Pending	Warragamba-100	Open Camp Site	Low	High
Pending	Warragamba-101	Isolated Artefact	Moderate	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-102	Isolated Artefact	Low	High
Pending	Warragamba-103	Isolated Artefact	Low	High
Pending	Warragamba-104	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-105	Open Camp Site	Low	High
Pending	Warragamba-106	Open Camp Site	Low	High
Pending	Warragamba-107	Open Camp Site	Moderate	High
Pending	Warragamba-108	Isolated Artefact	Low	High
Pending	Warragamba-109	Open Camp Site	Low	High
Pending	Warragamba-110	Open Camp Site	High	High
Pending	Warragamba-111	Open Camp Site	Moderate	High
Pending	Warragamba-112	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-113	Shelter with Art, Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-114	Axe Grinding Grooves	Moderate	High
Pending	Warragamba-115	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-116	Shelter with Art, Deposit Artefacts and Axe Grinding Grooves	High	High
Pending	Warragamba-117	Open Camp Site	Low	High
Pending	Warragamba-118	Open Camp Site	Low	High
Pending	Warragamba-119	Open Camp Site	Low	High
Pending	Warragamba-121	Isolated Artefact	Low	High
Pending	Warragamba-122	Open Camp Site	Low	High
Pending	Warragamba-123	Open Camp Site	Moderate	High
Pending	Warragamba-124	Open Camp Site	Low	High
Pending	Warragamba-125	Isolated Artefact	Low	High
Pending	Warragamba-126	Isolated Artefact	Low	High
Pending	Warragamba-127	Open Camp Site	Low	High
Pending	Warragamba-128	Open Camp Site	Low	High
Pending	Warragamba-129	Open Camp Site	Low	High
Pending	Warragamba-130	Isolated Artefact	Low	High
Pending	Warragamba-131	Shelter with Art, Deposit, and Isolated Artefact	Low	High
Pending	Warragamba-132	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-133	Water Hole	High	High
Pending	Warragamba-134	Isolated Artefact	Low	High
Pending	Warragamba-135	Shelter with Deposit and Axe Grinding Grooves	Low	High
Pending	Warragamba-136	Shelter with Deposit	Low	High
Pending	Warragamba-137	Open Camp Site	Moderate	High
Pending	Warragamba-138	Open Camp Site	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-139	Open Camp Site	Low	High
Pending	Warragamba-140	Open Camp Site	Low	High
Pending	Warragamba-141	Open Camp Site	Low	High
Pending	Warragamba-142	Open Camp Site	Low	High
Pending	Warragamba-143	Isolated Artefact	Low	High
Pending	Warragamba-144	Shelter with Art	Low	High
Pending	Warragamba-145	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-146	Open Camp Site	Low	High
Pending	Warragamba-147	Open Camp Site	Low	High
Pending	Warragamba-148	Open Camp Site	Low	High
Pending	Warragamba-149	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-150	Open Camp Site	Low	High
Pending	Warragamba-151	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-152	Open Camp Site	Low	High
Pending	Warragamba-153	Scarred Tree	Low	High
Pending	Warragamba-154	Open Camp Site	Low	High
Pending	Warragamba-155	Open Camp Site	Low	High
Pending	Warragamba-156	Open Camp Site	Low	High
Pending	Warragamba-157	Open Camp Site	Moderate	High
Pending	Warragamba-158	Open Camp Site	Low	High
Pending	Warragamba-159	Open Camp Site	Low	High
Pending	Warragamba-160	Open Camp Site	Low	High
Pending	Warragamba-161	Open Camp Site	Low	High
Pending	Warragamba-162	Isolated Artefact	Low	High
Pending	Warragamba-163	Open Camp Site	Low	High
Pending	Warragamba-164	Open Camp Site	Low	High
Pending	Warragamba-165	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-166	Open Camp Site	Low	High
Pending	Warragamba-167	Open Camp Site	Moderate	High
Pending	Warragamba-168	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-169	Open Camp Site	Low	High
Pending	Warragamba-170	Open Camp Site	Low	High
Pending	Warragamba-171	Open Camp Site	Low	High
Pending	Warragamba-172	Open Camp Site	Low	High
Pending	Warragamba-173	Open Camp Site	Low	High
Pending	Warragamba-174	Open Camp Site	Low	High
Pending	Warragamba-175	Open Camp Site	Low	High
Pending	Warragamba-176	Open Camp Site	Low	High
Pending	Warragamba-177	Open Camp Site	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-178	Open Camp Site	Low	High
Pending	Warragamba-179	Aboriginal Resource and Gathering	Low	High
Pending	Warragamba-180	Open Camp Site	Low	High
Pending	Warragamba-181	Shelter with Art, Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-182	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-183	Isolated Artefact	Low	High
Pending	Warragamba-184	Open Camp Site	Low	High
Pending	Warragamba-185	Open Camp Site	Low	High
Pending	Warragamba-186	Open Camp Site	Low	High
Pending	Warragamba-187	Shelter with Deposit	Low	High
Pending	Warragamba-188	Open Camp Site	Low	High
Pending	Warragamba-189	Open Camp Site	Low	High
Pending	Warragamba-191	Open Camp Site with Axe Grinding Grooves and Isolated Artefact	High	High
Pending	Warragamba-192	Shelter with Deposit	Low	High
Pending	Warragamba-193	Shelter with Art	Low	High
Pending	Warragamba-194	Open Camp Site	Low	High
Pending	Warragamba-195	Open Camp Site	Low	High
Pending	Warragamba-196	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-197	Open Camp Site	Low	High
Pending	Warragamba-198	Isolated Artefact	Low	High
Pending	Warragamba-199	Open Camp Site	Low	High
Pending	Warragamba-200	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-201	Open Camp Site	Low	High
Pending	Warragamba-202	Open Camp Site	Moderate	High
Pending	Warragamba-203	Open Camp Site	Low	High
Pending	Warragamba-204	Open Camp Site	Low	High
Pending	Warragamba-205	Open Camp Site	Low	High
Pending	Warragamba-206	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-207	Shelter with Axe Grinding Grooves and Deposit	Low	High
Pending	Warragamba-208	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-209	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-210	Open Camp Site	Low	High
Pending	Warragamba-211	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-212	Open Camp Site	Low	High
Pending	Warragamba-213	Open Camp Site	Low	High
Pending	Warragamba-214	Open Camp Site	Low	High
Pending	Warragamba-215	Open Camp Site	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-216	Open Camp Site	Low	High
Pending	Warragamba-217	Open Camp Site	Low	High
Pending	Warragamba-218	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-219	Shelter with Axe Grinding Grooves, Deposit, and Isolated Artefact	Low	High
Pending	Warragamba-220	Open Camp Site with Scarred Tree	Low	High
Pending	Warragamba-221	Open Camp Site	Low	High
Pending	Warragamba-222	Open Camp Site	Low	High
Pending	Warragamba-223	Shelter with Art and Artefacts	Low	High
Pending	Warragamba-224	Shelter with Deposit and Isolated Artefact	Low	High
Pending	Warragamba-225	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-226	Aboriginal Ceremony and Dreaming	Low	High
Pending	Warragamba-227	Open Camp Site	Low	High
Pending	Warragamba-228	Axe Grinding Grooves	Low	High
Pending	Warragamba-229	Open Camp Site	Low	High
Pending	Warragamba-230	Open Camp Site	Low	High
Pending	Warragamba-231	Open Camp Site	Low	High
Pending	Warragamba-232	Open Camp Site	Moderate	High
Pending	Warragamba-233	Aboriginal Resource and Gathering	Low	High
Pending	Warragamba-234	Open Camp Site	Low	High
Pending	Warragamba-235	Open Camp Site	Low	High
Pending	Warragamba-236	Open Camp Site	Low	High
Pending	Warragamba-237	Open Camp Site	Low	High
Pending	Warragamba-238	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-239	Shelter with Deposit and Isolated Artefact	Low	High
Pending	Warragamba-240	Shelter with Art, Deposit, and Isolated Artefact	Low	High
Pending	Warragamba-241	Open Camp Site	Low	High
Pending	Warragamba-242	Open Camp Site	Low	High
Pending	Warragamba-243	Shelter with Art, Deposit and Artefacts	Low	High
Pending	Warragamba-244	Open Camp Site	Low	High
Pending	Warragamba-245	Open Camp Site	Low	High
Pending	Warragamba-246	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-247	Open Camp Site	Moderate	High
Pending	Warragamba-248	Open Camp Site	Low	High
Pending	Warragamba-249	Open Camp Site	Low	High
Pending	Warragamba-250	Open Camp Site	Low	High
Pending	Warragamba-251	Open Camp Site	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-252	Open Camp Site	Low	High
Pending	Warragamba-253	Open Camp Site	Moderate	High
Pending	Warragamba-254	Shelter with Art, Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-255	Open Camp Site	Moderate	High
Pending	Warragamba-256	Open Camp Site	Low	High
Pending	Warragamba-257	Shelter with Axe Grinding Grooves	Low	High
Pending	Warragamba-258	Shelter with Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-259	Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks	High	High
Pending	Warragamba-260	Shelter with Isolated Artefact	Low	High
Pending	Warragamba-261	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-262	Open Camp Site	Low	High
Pending	Warragamba-263	Open Camp Site	Low	High
Pending	Warragamba-264	Open Camp Site	Moderate	High
Pending	Warragamba-265	Open Camp Site	Low	High
Pending	Warragamba-266	Open Camp Site	Low	High
Pending	Warragamba-267	Open Camp Site with Axe Grinding Grooves	Low	High
Pending	Warragamba-268	Open Camp Site	Low	High
Pending	Warragamba-269	Isolated Artefact	Low	High
Pending	Warragamba-271	Open Camp Site	Low	High
Pending	Warragamba-272	Open Camp Site	Low	High
Pending	Warragamba-273	Shelter with Deposit and Axe Grinding Grooves	Low	High
Pending	Warragamba-274	Shelter with Deposit and Axe Grinding Grooves	Low	High
Pending	Warragamba-275	Shelter with Art and Axe Grinding Grooves	Low	High
Pending	Warragamba-276	Shelter with Art and Axe Grinding Grooves	Low	High
Pending	Warragamba-277	Shelter with Deposit, Art, and Isolated Artefact	Low	High
Pending	Warragamba-278	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-279	Shelter with Art	Low	High
Pending	Warragamba-280	Shelter with Art	Low	High
Pending	Warragamba-281	Open Camp Site	Low	High
Pending	Warragamba-282	Shelter with Art, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-283	Axe Grinding Grooves	Low	High

AHIMS ID	Site Name	Site Type	Scientific significance	Cultural Significance
Pending	Warragamba-284	Shelter with Deposit and Axe Grinding Grooves	Low	High
Pending	Warragamba-285	Shelter with Deposit and Axe Grinding Grooves	High	High
Pending	Warragamba-286	Shelter with Art and Axe Grinding Grooves	Low	High
Pending	Warragamba-287	Shelter with Deposit and Axe Grinding Grooves	Low	High
Pending	Warragamba-288	Shelter with Deposit, Art, and Artefacts	High	High
Pending	Warragamba-289	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-290	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-291	Axe Grinding Grooves	High	High
Pending	Warragamba-292	Axe Grinding Grooves	Moderate	High
Pending	Warragamba-293	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-294	Open Camp Site	Low	High
Pending	Warragamba-295	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-296	Shelter with Deposit, Art, and Artefacts	Low	High
Pending	Warragamba-297	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-298	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-299	Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact	Low	High
Pending	Warragamba-300	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-301	Shelter with Deposit and Art	Low	High
Pending	Warragamba-302	Shelter with Deposit and Artefacts	Low	High
Pending	Warragamba-303	Open Camp Site	Low	High
Pending	Warragamba-304	Open Camp Site	Low	High
Pending	Warragamba-305	Axe Grinding Grooves	Low	High
Pending	Warragamba-306	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High
Pending	Warragamba-307	Shelter with Deposit and Artefacts	Low	High

11.4 Assessment/Statement of Scientific (Archaeological) Significance

The Scientific (Archaeological) value of the region and the Aboriginal objects contained within it is demonstrated by the 334 identified Aboriginal archaeological and cultural heritage sites, including: Aboriginal Resource and Gathering, Axe Grinding Grooves, Isolated Finds, Open Camp Sites, Scarred Trees, Stone Arrangements and Water Hole sites are predominately of low scientific (archaeological) value (approximately 82% of known, and relocated sites), with 22 sites of moderate (archaeological) value (approximately 7% of known sites). There are a further 40 sites of high (archaeological) values (approximately 11% of known sites).

The sites within the Subject Area are also predominately of low scientific (archaeological) significance 35 (81%), with 3 of moderate (archaeological) significance (6%) and 5 of high (archaeological) significance (12%).

The Subject Area has the potential to yield information that would contribute to a further understanding of the cultural history of the local area and region. In particular, the nature of past Aboriginal land-use of the Lake Burragorang valleys, and the relationship between past Aboriginal land use and the available resources including the Lake Burragorang valleys and the surrounding rivers, creeks and tributaries prior to the development of the dam as expressed through archaeological sites and their context.

A list of Aboriginal sites in the Survey Area, their scientific significance rating and a statement of significance is presented in Table 55, Annex 5 and a summary of scientific significance ratings is presented in Table 56.The scientific significance assessments and statements of significance for each site, with consideration given to each criterion, are presented in Annex 5.

Table 55: Summary of Scientific Significance Ratings for Aboriginal Sites within the Survey Area

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
	334			*43*		
Low Significance	272	82%	*Tonalli Cove 2 (AHIMS ID# 52-1-0131), Little River 1 (AHIMD ID #52-1-0127), Little River 2 (AHIMS ID# 52-1-0127), MF1 (AHIMS ID#52-1-0178), Warragamba-00 (AHIMS ID Pending), Warragamba-01 (AHIMS ID pending), Warragamba-02 (AHIMS ID pending), Warragamba-03 (AHIMS ID pending), Warragamba-05 (AHIMS ID pending), Warragamba-06 (AHIMS ID pending), Warragamba-07 (AHIMS ID pending), Warragamba-08 (AHIMS ID pending), Warragamba-09 (AHIMS ID #pending), Warragamba-11 (AHIMS ID pending), Warrtagamba-12 (AHIMS ID pending)(, Warragamba-13 (AHIMS ID pending),Warragamba-14 (AHIMS ID pending), Warragamba-16 (AHIMS ID pending), Warragamba-17 (AHIMS ID pending), Warragamba-18 (AHIMS ID pending), Warragamba-19 (AHIMS ID pending), Warragamba-20 (AHIMS ID pending), Warragamba-21 (AHIMS ID pending), Warragamba-23 (AHIMS ID pending), Warragamba-24 (AHIMS ID pending), Warragamba-25 (AHIMS ID pending), Warragamba-26 (AHIMS ID pending), Warragamba-27 (AHIMS ID pending), Warragamba-28 (AHIMS ID pending), Warragamba-29 (AHIMS ID pending), Warragamba-30 (AHIMS ID pending), Warragamba-31 (AHIMS ID pending), Warragamba-32 (AHIMS ID Pending), Warragamba-33 (AHIMS ID pending), Warragamba-34 (AHIMS ID pending), Warragamba-35 (AHIMS ID pending), Warragamba-36 (AHIMS ID pending), Warragamba-37 (AHIMS ID pending), Warragamba-41 (AHIMS ID pending), Warragamba-42 (AHIMS ID pending), Warragamba-43 (AHIMS ID pending), Warragamba-44 (AHIMS ID pending), Warragamba-45 (AHIMS ID pending), Warragamba-46 (AHIMS ID pending), Warragamba-47 (AHIMS ID pending), Warragamba-49 (AHIMS ID pending), Warragamba-50 (AHIMS ID pending), Warragamba-51 (AHIMS ID pending), Warragamba-52 (AHIMS ID Pending), Warragamba-53 (AHIMS ID pending), Warragamba-54 (AHIMS ID Pending), Warragamba-55 (AHIMS ID pending), Warragamba-56 (AHIMS ID pending), Warragamba-57 (AHIMS ID pending), Warragamba-58 (AHIMS ID pending), Warragamba-59 (AHIMS ID pending), Warragamba-60 (AHIMS ID pending), Warragamba-61 (AHIMS ID pending), Warragamba-62 (AHIMS ID pending), Warragamba-64 (AHIMS ID pending), Warragamba-65 (AHIMS ID pending), Warragamba-66 (AHIMS ID pending), Warragamba-67 (AHIMS ID pending), Warragamba-68 (AHIMS ID pending), Warragamba-69*	*35*	*81%*	*Warragamba-00 (AHIMS ID pending), Warragamba-32 (AHIMS ID pending), Warragamba-52 (AHIMS ID pending), Warragamba-54 (AHIMS ID pending), Warragamba-72 (AHIMS ID pending), Warragamba-80 (AHIMS ID pending), Warragamba-83 (AHIMS ID pending), Warragamba-93 (AHIMS ID pending), Warragamba-98 (AHIMS ID pending), Warragamba-100 (AHIMS ID pending), Warragamba-102 (AHIMS ID pending), Warragamba-103 (AHIMS ID pending), Warragamba-104 (AHIMS ID pending), Warragamba-108 (AHIMS ID pending), Warragamba-113 (AHIMS ID pending), Warragamba-132 (AHIMS ID pending), Warragamba-139 (AHIMS ID pending), Warragamba-148 (AHIMS ID pending), Warragamba-149 (AHIMS ID pending), Warragamba-150 (AHIMS ID pending), Warragamba-154 (AHIMS ID pending), Warragamba-158 (AHIMS ID pending), Warragamba-159 (AHIMS ID pending), Warragamba-161 (AHIMS ID pending), Warragamba-163 (AHIMSID# pending), Warragamba-187 (AHIMS ID pending), Warragamba-197 (AHIMS ID pending), Warragamba-228 (AHIMS ID pending), Warragamba-229 (AHIMS ID pending), Warragamba-233 (AHIMS ID pending), Warragamba-271 (AHIMS ID pending),*

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
			(AHIMS ID pending), Warragamba-70 (AHIMS ID pending), Warragamba-71 (AHIMS ID pending), Warragamba-72 (AHIMS ID Pending), Warragamba-73 (AHIMS ID pending), Warragamba-74 (AHIMS ID pending), Warragamba-76 (AHIMS ID pending), Warragamba-77 (AHIMS ID pending), Warragamba-78 (AHIMS ID pending), Warragamba-79 (AHIMS ID pending), Warragamba-80 (AHIMS ID Pending), Warragamba-81 (AHIMS ID pending), Warragamba-82 (AHIMS ID pending), Warragamba-83 (AHIMS ID Pending), Warragamba-84 (AHIMS ID pending), Warragamba-85 (AHIMS ID pending), Warragamba-86 (AHIMS ID pending), Warragamba-89 (AHIMS ID pending), Warragamba-90 (AHIMS ID pending), Warragamba-91 (AHIMS ID pending), Warragamba-92 (Pending), Warragamba-93 (AHIMS ID Pending), Warragamba-95 (AHIMS ID pending), Warragamba-96 (AHIMS ID pending), Warragamba-97 (AHIMS ID pending), Warragamba-98 (AHIMS ID Pending), Warragamba-99 (AHIMS ID pending), Warragamba-100 (AHIMS ID Pending), Warragamba-102 (AHIMS ID Pending), Warragamba-103 (AHIMS ID Pending), Warragamba-104 (AHIMS ID Pending), Warragamba-105 (AHIMS ID pending), Warragamba-106 (AHIMS ID pending), Warragamba-108 (AHIMS ID Pending), Warragamba-109 (AHIMS ID pending), Warragamba-112 (AHIMS ID pending), Warragamba-113 (AHIMS ID Pending), Warragamba-115 (AHIMS ID pending), Warragamba-117 (AHIMS ID pending), Warragamba-118 (AHIMS ID pending), Warragamba-119 (AHIMS ID pending), Warragamba 121, (AHIMS ID pending), Warragamba-122 (AHIMS ID pending), Warragamba-124 (AHIMS ID pending), Warragamba-125 (AHIMS ID pending), Warragamba-126 (AHIMS ID pending), Warragamba-127 (AHIMS ID pending), Warragamba-128 (AHIMS ID pending), Warragamba-129 (AHIMS ID pending), Warragamba-130 (AHIMS ID pending), Warragamba-131 (AHIMS ID pending), Warragamba-132 (AHIMS ID Pending), Warragamba-134 (AHIMS ID pending), Warragamba-135 (AHIMS ID pending), Warragamba-136 (AHIMS ID pending), Warragamba-138 (AHIMS ID pending), Warragamba-139 (AHIMS ID Pending), Warragamba-140 (AHIMS ID pending), Warragamba-141 (AHIMS ID pending), Warragamba-142 (AHIMS ID pending), Warragamba-143, (AHIMS ID pending), Warragamba-144 (AHIMS ID pending), Warragamba-145 (AHIMS ID pending), Warragamba-146 (AHIMS ID pending), Warragamba-147 (AHIMS ID pending), Warragamba-148 (AHIMS ID pending), Warragamba-149 (AHIMS ID Pending), Warragamba-150 (AHIMS ID Pending), Warragamba-151 (AHIMS ID Pending), Warragamba-152 (AHIMS ID Pending), Warragamba-153 (AHIMS ID			*Warragamba-298 (AHIMS ID pending), Warragamba-300 (AHIMS ID pending),*

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
			pending), Warragamba-154 (AHIMS ID Pending), Warragamba-155 (AHIMS ID pending), Warragamba-156 (AHIMS ID pending), Warragamba-158 (AHIMS ID Pending), Warragamba-159 (AHIMS ID Pending), Warragamba-160 (AHIMS ID pending), Warragamba-161 (AHIMS ID Pending), Warragamba-162 (AHIMS ID pending), Warragamba-163 (AHIMS ID Pending), Warragamba-164 (AHIMS ID pending), Warragamba-165 (AHIMS ID pending),Warragamba-166 (AHIMS ID pending), Warragamba-168 (AHIMS ID pending), Warragamba-169 (AHIMS ID pending), Warragamba-170 (AHIMS ID pending), Warragamba-171 (AHIMS ID Pending), Warragamba-172 (AHIMS ID pending), Warragamba-173 (AHIMS ID pending), Warragamba-174 (AHIMS ID pending), Warragamba-175 (AHIMS ID pending), Warragamba-176 (AHIMS ID pending), Warragamba-177 (AHIMS ID pending), Warragamba-178 (AHIMS ID pending), Warragamba-179 (AHIMS ID pending), Warragamba-180 (AHIMS ID pending), Warragamba-181 (AHIMS ID pending), Warragamba-182 (AHIMS ID Pending), Warragamba-183 (AHIMS ID pending), Warragamba-184 (AHIMS ID pending), Warragamba-185 (AHIMS ID pending), Warragamba-186 (AHIMS ID pending), Warragamba-187 (AHIMS ID Pending), Warragamba-188 (AHIMS ID pending), Warragamba-189 (AHIMS ID pending), Warragamba-192 (AHIMS ID pending), Warragamba-193 (AHIMS ID pending), Warragamba-194 (AHIMS ID pending), Warragamba-195 (AHIMS ID pending), Warragamba-196 (AHIMS ID pending), Warragamba-197 (AHIMS ID Pending), Warragamba-198 (AHIMS ID pending), Warragamba-199 (AHIMS ID pending), Warragamba-200 (AHIMS ID pending), Warragamba-201 (AHIMS ID pending), Warragamba-203 (AHIMS ID pending), Warragamba-204 (AHIMS ID pending), Warragamba-205 (AHIMS ID pending), Warragamba-206 (AHIMS ID pending), Warragamba-207 (AHIMS ID pending), Warragamba-208 (AHIMS ID pending), Warragamba-209 (AHIMS ID pending), Warragamba-210 (AHIMS ID pending), Warragamba-211 (AHIMS ID pending), Warragamba-212 (AHIMS ID pending), Warragamba-213 (AHIMS ID pending), Warragamba-214 (AHIMS ID pending), Warragamba-215 (AHIMS ID pending), Warragamba-216 (AHIMS ID pending), Warragamba-217 (AHIMS ID pending), Warragamba-218 (AHIMS ID pending), Warragamba-219 (AHIMS ID pending), Warragamba-220 (AHIMS ID pending), Warragamba-221 (AHIMS ID pending), Warragamba-222 (AHIMS ID pending), Warragamba-223 (AHIMS ID Pending), Warragamba-224 (AHIMS ID pending), Warragamba-225 (AHIMS ID pending), Warragamba-226 (AHIMS ID pending), Warragamba-227 (AHIMS ID pending), Warragamba-228 (AHIMS ID			

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
			Pending), Warragamba-229 (AHIMS ID Pending), Warragamba-230 (AHIMS ID pending), Warragamba-231 (AHIMS ID pending), Warragamba-233 (AHIMS ID Pending), Warragamba-234 (AHIMS ID pending), Warragamba-235 (AHIMS ID pending), Warragamba-236 (AHIMS ID pending), Warragamba-237 (AHIMS ID pending), Warragamba-238 (AHIMS ID pending), Warragamba-239 (AHIMS ID pending), Warragamba-240 (AHIMS ID pending), Warragamba-241 (AHIMS ID pending), Warragamba-242 (AHIMS ID pending), Warragamba-243 (AHIMS ID pending), Warragamba-244 (AHIMS ID pending), Warragamba-245 (AHIMS ID pending), Warragamba-246 (AHIMS ID pending), Warragamba-248 (AHIMS ID pending), Warragamba-249 (AHIMS ID pending), Warragamba-250 (AHIMS ID pending), Warragamba-251 (AHIMS ID pending), Warragamba-252 (AHIMS ID pending), Warragamba-254 (AHIMS ID pending), Warragamba-256 (AHIMS ID pending), Warragamba-257 (AHIMS ID pending), Warragamba-258 (AHIMS ID pending), Warragamba-260 (AHIMS ID pending), Warragamba-261 (AHIMS ID pending), Warragamba-262 (AHIMS ID pending), Warragamba-263 (AHIMS ID pending), Warragamba-265 (AHIMS ID pending), Warragamba-266 (AHIMS ID pending), Warragamba-268 (AHIMS ID pending), Warragamba-269 (AHIMS ID pending), Warragamba-271 (AHIMS ID pending), Warragamba-272 (AHIMS ID pending), Warragamba-273 (AHIMS ID pending), Warragamba-274 (AHIMS ID pending), Warragamba-275 (AHIMS ID pending), Warragamba-276 (AHIMS ID Pending), Warragamba-277 (AHIMS ID Pending), Warragamba-278 (AHIMS ID Pending), Warragamba-279 (AHIMS ID Pending)Warragamba-280 (AHIMS ID pending), Warragamba-281 (AHIMS ID pending), Warragamba-282 (AHIMS ID pending), Warragamba-283 (AHIMS ID pending), Warragamba-284 (AHIMS ID pending), Warragamba-286 (AHIMS ID pending), Warragamba-287 (AHIMS ID pending), Warragamba-289 (AHIMS ID pending), Warragamba-290 (AHIMS ID pending), Warragamba-293 (AHIMS ID pending), Warragamba-294 (AHIMS ID pending), Warragamba-295 (AHIMS ID pending), Warragamba-296 (AHIMS ID pending), Warragamba-297 (AHIMS ID pending), Warragamba-298 (AHIMS ID Pending), Warragamba-299 (AHIMS ID pending), Warragamba-300 (AHIMS ID Pending), Warragamba-301 (AHIMS ID pending), Warragamba-302 (AHIMS ID pending) and Warragamba-303 (AHIMS ID pending), Warragamba-304 (AHIMS ID Pending), Warragamba-305 (AHIMS ID Pending), Warragamba-306 (AHIMS ID Pending), Warragamba-307 (AHIMS ID Pending).			

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
Moderate Significance	22	7%	*Warragamba-10 (AHIMS ID Pending), Warragamba-101 (AHIMS ID Pending), Warragamba-107 (AHIMS ID Pending), Warragamba-111 (AHIMS ID Pending), Warragamba-114 (AHIMS ID Pending), Warragamba-123 (AHIMS ID Pending), Warragamba-137 (AHIMS ID Pending), Warragamba-15 (AHIMS ID Pending), Warragamba-157 (AHIMS ID Pending), Warragamba-167 (AHIMS ID Pending), Warragamba-202 (AHIMS ID Pending), Warragamba-22 (AHIMS ID Pending), Warragamba-232 (AHIMS ID Pending), Warragamba-247 (AHIMS ID Pending), Warragamba-253 (AHIMS ID Pending), Warragamba-255 (AHIMS ID Pending), Warragamba-292 (AHIMS ID Pending), Warragamba-38 (AHIMS ID Pending), Warragamba-63(AHIMS ID Pending), Warragamba-88 (AHIMS ID Pending), Warragamba-94 (AHIMS ID Pending), Warragamba-264 (AHIMS ID Pending)*	*3*	*7%*	*Warragamba-88 (AHIMS ID pending), Warragamba-111 (AHIMS ID pending), Warragamba-114 (AHIMS ID pending),*
High Significance	40	11%	*Ashtons 1 (AHIMS ID# 45-4-0966), Bimlow PAD (AHIMS ID# 45-4-0997), Burra Lake Flake 1 (AHIMS ID# 52-1-0236), Byrnes Bay OS-1 (AHIMS ID# 52-1-0332), CA 1; Warragamba Dam Special Area (AHIMS ID# 45-4-0930), EH 1; Warragamba Special Area (AHIMS ID#45-4-0931), Grahams Landing (AHIMS ID# 45-4-0191), Green Wattle Point (AHIMS ID# 52-1-0136), Green Wattle Point OS-1 (AHIMS ID# 52-1-0345), GW5 (AHIMS ID# 45-4-0948), Jooriland Creek, Upper Burragorang (AHIMS ID# 52-1-0045), Joorilands Farm 1 (AHIMS ID# 52-1-0168), Joorilands Farm 2 (AHIMS ID# 52-1-0170), Joorilands Farm 3 (AHIMS ID# 52-1-0171), Joorilands OS-1 (AHIMS ID# 52-1-0346),JUNCTION POINT 1 (AHIMS ID# 45-4-0983), Kamilaroi Point (AHIMS ID# 52-1-0142), Kedumba; Kedumba Crossing (AHIMS ID# 45-4-0187), Little River 3 (AHIMS ID# 52-1-0128), Policeman's Point (AHIMS ID# 45-4-0186), RC1 (AHIMS ID# 45-4-0967) Tonalli Cove 1 (AHIMS ID#52-1-0130), Tonalli Cove 4 (AHIMS ID#52-1-013), Tonalli OS-1 (AHIMS ID#52-1-0352), TR 1 (AHIMS ID#45-4-0946), Upper Wollondilly 2*	*5*	*12%*	*Policeman's Point (AHIMS ID#45-4-0186), RC 1 (AHIMS ID#45-4-0967), Joorilands Creek, Upper Burragorang (AHIMS ID#52-1-0045), Green Wattle Point OS-1 (AHIMS ID#52-1-0345), Warragamba-110 (AHIMS ID pending),*

Scientific Significance Rating	Site Count Survey Area	Percent-age of Sites	Sites	Site Count PUIA	Percentage of Sites	Sites within the PUIA
			(AHIMS ID#52-1-014), W223, Byrnes Creek (AHIMS ID#52-1-0186), Warragamba-110 (AHIMS ID Pending), *Warragamba-116 (AHIMS ID Pending), Warragamba-133* *(AHIMS ID Pending), Warragamba-191 (AHIMS ID Pending), Warragamba-259 (AHIMS ID Pending),* *Warragamba-267 (AHIMS ID Pending), Warragamba-285* *(AHIMS ID Pending), Warragamba-288 (AHIMS ID Pending), Warragamba-291 (AHIMS ID Pending) Warragamba-39 (AHIMS ID Pending), Warragamba-40* *(AHIMS ID Pending), Warragamba-48 (AHIMS ID Pending)* *Warragamba-75 (AHIMS ID Pending)*			

12. Impact assessment

12.1 Overview of Potential Impacts and Harm

The *Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) requires that both direct and indirect harm to Aboriginal objects and Aboriginal places be considered. Generally direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects as an indirect consequence of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area because of an activity.

The *Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) requires that both direct and indirect harm be considered. Generally direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects because of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area.

The Project has the potential to harm Aboriginal objects and Aboriginal cultural values during the operational phase. As highlighted in Section 12.1 to Section 12.5.1of this assessment there is potential for the proposed project to harm Aboriginal objects and cultural values during PMF events. The potential harm and impacts may be derived from varied levels of submersion under water for between 1 and 14 days.

As required by the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b), the likely impacts (and partial loss of value) to Aboriginal heritage sites as a result of the Project is presented in Table 56.

12.1.1 Potential impacts to the Greater Blue Mountains World Heritage Area

The boundary of the GBMWHA generally does not correspond with the boundaries of Lake Burragorang and its tributaries or Full Supply Level. In most locations around Lake Burragorang there is a “buffer” or strip of land which is in a National Park – but not part of the GBMWHA. The major exception to this is along the southern bank of the Wollondilly River arm of Lake Burragorang where the GBMWHA and the Nattai National Park boundary extends down to the Full Supply Level of the dam. Other areas where the GBMWHA boundary extends to the Full Supply Level or to the bank of a potentially impacted waterway include:

- Nattai River near the Little River confluence (Nattai National Park)
- A small reach of the Kedumba River (Blue Mountains National Park)
- Reaches of the Kowmung and Coxs Rivers about 3 km upstream of their confluence (Blue Mountains National Park)
- A number of minor tributaries which flow directly into Lake Burragorang (Blue Mountains National Park).

The PUIA includes 304 ha of land which is part of the GBMWHA. The surveys covered 173 ha (57%) of this area. A total of 43 Aboriginal sites were identified in the GBMWHA. Of these 20 sites are in the EUIA and already impacted by the existing dam. There are 8 sites within the PUIA and will be impacted due to the

Project. The remaining 15 sites are above the PUIA and very unlikely to be affected by the Project (see Table 56).

Table 56: Known Aboriginal sites in the GBMWHA and potential impacts

Site type	Number of sites	Scientific significance	Cultural significance	Potential impact
Sites within the EUIA (excluding area below FSL)				
Aboriginal Resource and Gathering	1	Low	High	Total loss of value
Open Camp Site	19	Low – 15 sites Moderate – 1 site High – 3 sites	High	Total loss of value
Subtotal	**20**			
Sites within the PUIA				
Axe Grinding Grooves	1	High	High	Total loss of value
Isolated Artefact	1	Low	High	Total loss of value
Open Camp Site	6	Low	High	Total loss of value
Subtotal	**8**			
Sites in the Subject Area above the PUIA				
Open Camp Site	9	Low	High	No loss of value
Shelter with Deposit and Art	1	High	High	No loss of value
Shelter with Deposit and Artefacts	5	Low	High	No loss of value
Subtotal	**15**			

12.2 Potential Impacts from Surface Disturbance

12.2.1 Surface Infrastructure

A detailed description of the surface infrastructure components of the Project is provided in Section 3 of this report, including the dam abutments, main spillway, auxiliary spillway, auxiliary construction facilities and other infrastructure elements.

The main surface infrastructure components of the Project (Section 3) would be developed within the surface investigation areas that cover an area of approximately 100 ha of which about 33 ha would be directly disturbed. For this assessment it is therefore conservatively assumed that the development of surface infrastructure for the Project would be wholly within the determined footprint and would be of a nature that would cause direct harm to any Aboriginal objects or areas of cultural value located within the footprint.

The potential harm associated with surface disturbance activities would cause either a total or partial loss of heritage value at any effected site and would have a cumulative or landscape impact of partial loss of values for the area as a whole. The activities that may potentially cause harm to Aboriginal objects or areas of cultural value would include:

- vegetation clearance and topsoil stripping;
- disturbance of soil units or the ground surface with Aboriginal objects on the surface or within the soil profile
- changes to the context of a site or place that has indirect impacts to the site or place, resulting in the loss of cultural values
- excavation works and the removal and redistribution of rock and soil by heavy machinery during site regrading or development of suitable surface conditions for various construction activities.

The proposed surface infrastructure avoids all rockshelters, grinding grooves and natural landscape features and therefore there would be no potential surface disturbance impacts to any of these site types or any sites with moderate or high scientific significance.

The AHIMS registered site Folley Creek (AHIMS ID# 45-5-0638) is registered within close proximity to the exclusion zone around the Fountain Batch Plant 2 and laydown area (Figure 9). During the survey this site was not relocated and further analysis of the AHIMS site card highlights that this site is not located here because its location co-ordinates have been transcribed incorrectly on AHIMS. An amendment will be forwarded through to the Heritage NSW of Folley Creek's site card so that AHIMS can be updated.

In conclusion there are no known Aboriginal cultural heritage sites or natural landscape features within the footprint of the proposed surface infrastructure. As discussed in Section 12.3 no Aboriginal cultural heritage sites or natural landscape features of moderate or high significance are predicted to occur within the surface infrastructure footprint.

12.3 Potential impacts from temporary inundation

12.3.1 Overview

Flooding upstream of Lake Burragorang can result from inundation as the lake level rises due to flood inflows, from local catchment runoff, or a combination of the two. Flooding due to inundation is generally restricted to the area around the lake perimeter with flooding due to local catchment runoff dominating moving further up the catchment. Flooding beyond the Project study area is due to local catchment runoff. The extent of the upstream inundation is controlled by the peak flood level at the dam wall and the upstream catchment topography. Where the Wollondilly River and Coxs River enter Lake Burragorang the terrain is relatively flat, and the inundated area and the rate of inundation are both greater than they are in the steeper terrain further upstream.

The Project would result in some upstream areas experiencing a greater extent and duration of temporary water inundation when the FMZ is operational compared to the existing dam. These additional periods of inundation are predicted to last between hours and about 10 days, depending on the site location, intensity and amount of rain and corresponding size of flood mitigation that is required.

Project impact assessment has focused on the PUIA which covers 1,401 hectares between RL 119.5 mAHD and RL 126.97 mAHD. Based on historical flood records and detailed flood modelling, this is the area most likely to be impacted by the Project (the flood event of November 1961 reached a height of RL 119.35 mAHD, nearly three metres above FSL). The EUIA comprises the area below RL 119.5 mAHD, including below FSL (with all sites below FSL already impacted by the existing dam). Above the FSL there is potential for the Project to increase duration and depth of flooding within the EUIA.

There are 29 Aboriginal cultural heritage sites located in the Subject Area above the PUIA and are in an area of very low risk of being affected by the Project. The risk of harm to sites identified above the PUIA is very much less than that for sites within the PUIA as inundation events are expected to be far less frequent and of much less duration (lasting only hours) than what will be experienced in the PUIA. The Aboriginal cultural heritage sites above the PUIA are listed below in Table 57.

Table 57: Aboriginal cultural heritage sites located above the PUIA

AHIMS ID	Site Name	Site Feature
45-4-0968	Butchers 2	Grinding Groove
52-1-0173	W104, Warragamba Special Area	Modified Tree (Carved or Scarred)
45-4-0188	Butchers Creek 1;	Artefact
52-1-0168	Joorilands Farm 1	Artefact
52-1-0133	Tonalli Cove 4	Artefact
52-1-0138	Bridge Point 2	Artefact
52-1-0171	Joorilands Farm 3	Modified Tree (Carved or Scarred)
52-1-0180	MF3, Murphy's Flat - Warragamba Special Area	Artefact
52-1-0131	Tonalli Cove 2	Artefact
52-1-0248	Joorilands Farm 6	Modified Tree (Carved or Scarred)
52-1-0128	Little River 3	Artefact
52-1-0132	Tonalli Cove 3	Artefact
52-1-0142	Kamilaroi Point	Artefact
Pending	Warragamba-01	Open Camp Site
Pending	Warragamba-03	Open Camp Site
Pending	Warragamba-06	Open Camp Site
Pending	Warragamba-12	Open Camp Site
Pending	Warragamba-57	Shelter with Deposit and Artefacts
Pending	Warragamba-58	Shelter with Deposit and Artefacts
Pending	Warragamba-59	Open Camp Site
Pending	Warragamba-68	Open Camp Site
Pending	Warragamba-75	Aboriginal Resource and Gathering
Pending	Warragamba-79	Open Camp Site with Scarred Tree
Pending	Warragamba-116	Shelter with Art, Deposit, Artefacts and Axe Grinding Grooves
Pending	Warragamba-131	Shelter with Art, Deposit and Isolated Artefact
Pending	Warragamba-162	Isolated Artefact
Pending	Warragamba-166	Open Camp Site
Pending	Warragamba-172	Open Camp Site
Pending	Warragamba-209	Shelter with Art, Deposit and Artefacts

The potential physical impacts on Aboriginal heritage sites can vary, depending on site type, for example:

- stone artefact sites will be subject to changed ground conditions such as waterlogging, movement of objects or erosion
- sandstone shelter sites will be subject to altered conditions that may detrimentally effect deposits and rock art.
- scarred trees will be subject to more frequent flooding- though none are located within the Subject Area.

- axe grinding grooves and engravings will be more frequently submerged, altering natural conditions and possibly their preservation
- Aboriginal ceremony and dreaming sites and Aboriginal resource and gathering sites will have their accessibility altered, and physical aspects of the sites may also change.

Aboriginal heritage sites were divided into three areas reflecting different elevations in the upstream area, and which are described as follows:

1. Sites that are within the existing dam footprint (EUIA) –this area contains sites below the FSL (the maximum water level of Lake Burragorang which will not change with the Project) and sites between the FSL and the PUIA. Sites below the FSL experience regular and prolonged inundation as they are below the permanent maximum water level of the existing dam. Sites above the FSL experience inundation less regularly than those below FSL but more frequently than sites in the PUIA or at higher elevations. The sites in the EUIA have been given a partial impact from the Project as the connection of these sites to the cultural landscape would be further impacted.
2. Sites within the PUIA – these sites have a lesser risk of being impacted by existing flooding compared to sites in the EUIA. This risk would increase with the Project and, for the purpose of the assessment, a precautionary approach has been adopted and it has been assumed there would be a total loss of values for sites in this area.
3. Subject Area above the PUIA – these sites have a very low risk of being impacted by flooding. There are also two sites outside of the construction impact zone.
4. Outside of the Subject Area – these sites are beyond any potential flooding risk from the Project.

To assess the risk of inundation to identified sites:

- The elevation of each site was cross-referenced to the above categories. Of note is that some large sites extend above and below the EUIA, over several hundred square metres. The number of sites in each of these categories is summarised in Table 58. Of the 334 identified sites, 43 sites are located within the PUIA, 183 sites within the EUIA and 108 sites outside of these areas
- An assessment was undertaken of the consequences of harm (total, partial or no loss of value), to each site, which was based on scientific significance, cultural significance, type of harm (direct or indirect) and degree of harm. This assessment is provided in Table 59 and summarised in Table 60.

Upstream operational impacts of the Project would occur in the Lake Burragorang catchment and tributaries which flow into Lake Burragorang. This includes areas of National Park, State Conservation Areas and the Greater Blue Mountains World Heritage Area. The Project would result in some upstream areas experiencing a greater extent and duration of temporary water inundation when the Flood Mitigation Zones is operational compared to the existing dam. These additional periods of inundation are predicted to last between hours and 10 days, depending on the site location, intensity and amount of rain and corresponding size of flood mitigation that is required.

To assess the risk of inundation to each site which was recorded in this survey, the height of each site was cross-referenced to flooding scenarios. Height of sites was given through spot heights taken at relevant points of each site, and therefore provide the average height above datum for large open sites (some of which extend above and below the EUIA, over several hundred square meters). For smaller sites (such as those comprised of rockshelters), this measurement is more specific. It was the case for many larger open sites that appear below the EUIA, that part of these sites was also yet to be impacted by inundation. These heights were targeted so as to capture any potential risk of inundation to each site.

The sites were assessed to be impacted if there was any level of flooding under any of the flooding scenarios (both current and predicted). Degree of impact to sites was measured by immersion time, given in days. Immersion time was also calculated as an increase to current immersion for specific flooding scenarios Table 58 shows whether each site is currently impacted, if there is any impact expected from the project, and the level of increase expected for each site (if any) based on the extent of flooding that would occur between the EUIA and the PUIA.

Of the 334 new and previously registered on AHIMS Aboriginal cultural heritage sites identified during this assessment a total of 43 sites are located within the PUIA. In addition to these 43 sites a further 45 sites are within the Subject Area. A further 246 sites were identified as being outside the Subject Area (n=63) or in the EUIA (n=183).

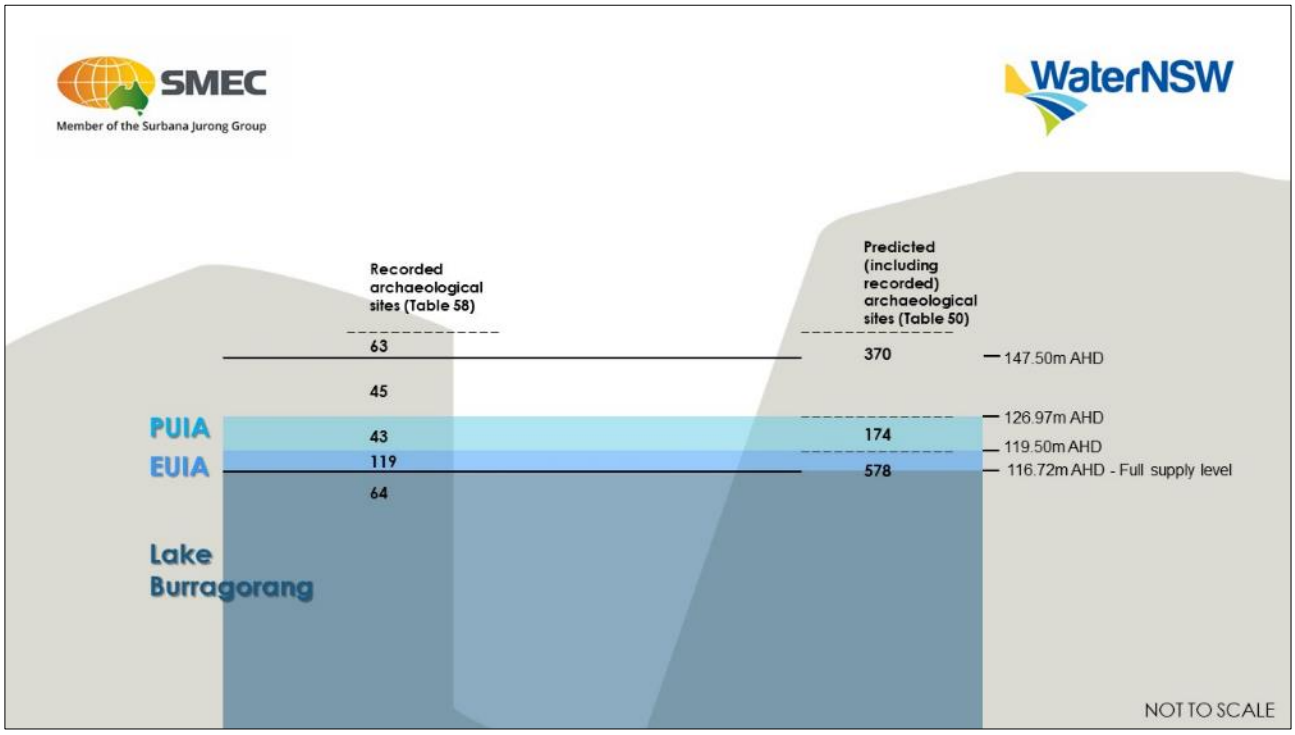


Diagram 2. Distribution of archaeological sites across the Survey Area.

There are 64 Aboriginal archaeological cultural heritage sites located within the Full Supply Level of the Warragamba Dam. Due to the low water levels during the survey many of these sites were identified during the surveys associated with the Project. A number had also previously been recorded on AHIMS during previous work associated with the maintenance of the dam and its associated access tracks.

Table 58: Aboriginal site types and location within the Survey Area

	Outside the PUIA	PUIA	EUIA	Total
Aboriginal Ceremony and Dreaming			1	1
Aboriginal Resource and Gathering	1	1	2	4
Axe Grinding Grooves	1	4	3	8
Isolated Artefact	6	6	9	21
Open Camp Site	36	23	136	195
Open Camp Site with Axe Grinding Grooves			1	1
Open Camp Site with Axe Grinding Grooves and Isolated Artefact	1		1	2
Open Camp Site with Axe Grinding Grooves and Scarred Tree	1			1
Open Camp Site with Scarred Tree	3		5	8
Scarred Tree	5			5
Shelter with Art	2	1		3
Shelter with Art and Artefacts			2	2
Shelter with Art and Axe Grinding Grooves	3			3
Shelter with Art, Artefacts and Axe Grinding Grooves	1		1	2
Shelter with Artefacts and Axe Grinding Grooves			1	1
Shelter with Axe Grinding Grooves	1			1
Shelter with Deposit	4	1	1	6
Shelter with Deposit and Art	2		1	3
Shelter with Deposit and Artefacts	11	4	8	23
Shelter with Deposit and Axe Grinding Grooves	6		1	7
Shelter with Deposit and Isolated Artefact	1		1	2
Shelter with Deposit, Art, and Artefacts	7		3	10
Shelter with Deposit, Art, and Isolated Artefact	3			3
Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	8			8
Shelter with Deposit, Artefacts and Axe Grinding Grooves	3	1	1	5
Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks			1	1
Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact		1	1	2
Shelter with Isolated Artefact			1	1
Stone Arrangement	1	1		2
Water Hole	1		1	2
Water hole and Aboriginal Ceremony and Dreaming			1	1
Grand Total	**108***	**43**	**183**	**334**

** Includes 63 sites outside of the Subject Area*

12.3.2 Assessment of potential impacts

The geomorphology technical assessment 'Warragamba Dam Raising EIS' completed by BECA identified several potential impacts of varying risk and probability to the geomorphology of the Subject Area that could result in impact on Aboriginal cultural heritage sites within the EUIA and PUIA. The main potential impacts noted within the report included; out of bank and shoreline erosion, translocation of sediment features, elevated erosion of shoreline banks and cumulative bank erosion. These impacts could potentially affect Aboriginal cultural heritage sites that occur across multiple slope classes within the Subject Area. In particular, gentle slopes, moderate to steep slopes and very steep to precipitous slopes.

The translocation of sediment features, for example in the Coxs and Wollondilly Rivers, may result in the deposition of sediments on Aboriginal cultural heritage sites such as axe grinding groove sites and isolated artefacts during temporary inundation events. This would affect some sites located on gently inclined slopes that are situated within the flooding impact zone, for example, Aboriginal resource gathering sites (Table 59). A proportionate amount of the sedimentation load transported during inundation events will subsequently be washed back into the main body of the lake as floodwaters recede. This will decrease the impact on Aboriginal cultural heritage sites located on gently inclined slopes. The sediment transported would consist of silts, clays, and organic matter. Dense particles such as sand and gravel are unlikely to be present as they would be deposited instead in the mouths of the inlet rivers (BECA 2021:110). The main area of sediment deposition is likely to be on the existing foreshore up to the EUIA, which is already denuded and contains little vegetation. As a result, inundation events are unlikely to cause denudation across the Subject Area which decreases the risk of extensive damage to Aboriginal cultural heritage sites.

Cumulative bank erosion as a result of temporary inundation events may result in impact on Aboriginal cultural heritage sites located on moderate to steeper slopes, for example, sandstone shelter sites and Aboriginal resource gathering sites. Temporary inundation, as noted in the geomorphology technical assessment, increases waterflow which in turn will temporarily increase stream power resulting in attritional bank scour (BECA 2021:114). This direct removal of bank materials by the physical action of flowing water and the sediment that it carries will increase the rate of erosion of banks and shorelines. The resulting bank instability could potentially affect moderate to steeper slopes where Aboriginal cultural heritage sites are located, as the prolonged wave undercutting could to lead to erosion and exposure of sheer cliff faces and unstable soil (BECA 2021:86). For instance, Lake Burragorang is identified as having elevated banks and terraces that have been subject to infrequent wave actions, causing bank erosion. It is noted within the report (BECA 2021:114) that the bank erosion data utilised to estimate the rate of erosion is indicative, therefore the scale of change associated with temporary inundation should not be treated as absolute for the change in bank erosion risk.

Elevated erosion of shoreline banks may result in impact towards Aboriginal cultural heritage sites located on very steep to precipitous slopes, such as Aboriginal resource gathering sites and sandstone shelter sites. Exposure of sheer cliff faces can result in landslides or rockfall which could potentially affect Aboriginal cultural heritage sites located within close proximity. For instance, it is noted that along the immediate foreshores and adjacent slopes of Lake Burragorang, known landslides have occurred due to the exposure and weathering of cliff faces (BECA 2021:106). These landslides have been directly linked to the Permian strata, which is susceptible to weathering. Therefore, the erosion of cliff faces comprised of the Permian strata are expected to continue. Areas that are comprised of steep sandstone cliffs with good riparian vegetation are less likely to be adversely affected by erosion caused by temporary inundation. This decreases the risk of impact to Aboriginal cultural heritage sites located on very steep to precipitous slopes. Table 59 provides a summary of potential impacts of the project on Aboriginal cultural heritage sites as well as a summary of potential harm.

12.4 Summary of Potential Impacts to Aboriginal Cultural Heritage Sites

Impacts on Aboriginal cultural heritage sites within the Subject Area is determined as any site that falls between the EUIA and PUIA, as outlined in Section 6.3; that is submerged by water from anywhere between 1 and 10 days. As a result of this submersion the site can suffer varying impacts depending on site type, for example:

- stone artefact sites will be subject to changed ground conditions such as waterlogging, movement of objects or erosion.
- sandstone shelter sites will be subject to altered conditions that may detrimentally effect deposits and rock art.
- scarred trees will be subject to more frequent flooding.
- axe grinding grooves and engravings will be more frequently submerged, altering natural conditions and possibly their preservation.
- Aboriginal ceremony and dreaming sites and Aboriginal resource and gathering sites will have their accessibility altered, and physical aspects of the sites may also change.

Table 59: Summary of Potential Impacts of the Project on Aboriginal Heritage Sites and Summary of Potential Harm

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
45-4-0186	Policeman's Point	Shelter with Deposit, Artefacts and Axe Grinding Grooves	High	High	Direct	Total	Total Loss of Value
45-4-0187	Kedumba; Kedumba Crossing	Open Camp Site	High	High	None	None	No Loss of Value
45-4-0191	Grahams Landing	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
45-4-0930	CA 1; Warragamba Dam Special Area	Open Camp Site	High	High	Indirect	Partial	Total l Loss of Value
45-4-0931	EH 1; Warragamba Special Area	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
45-4-0946	TR 1	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
45-4-0948	GW5	Open Camp Site	High	High	None	None	No Loss of Value
45-4-0966	Ashtons 1	Axe Grinding Grooves	High	High	None	None	No Loss of Value
45-4-0967	RC1	Open Camp Site	High	High	Direct	Total	Total Loss of Value
45-4-0983	JUNCTION POINT 1	Open Camp Site	High	High	None	None	No Loss of Value
45-4-0997	Bimlow PAD	Shelter with Art, Artefacts and Axe Grinding Grooves	High	High	Indirect	Partial	Total Loss of Value
52-1-0045	Jooriland Creek, Upper Burragorang	Axe Grinding Grooves	High	High	Direct	Total	Total Loss of Value
52-1-0126	Little River 1	Open Camp Site	Low	High	None	None	No Loss of Value
52-1-0127	Little River 2	Open Camp Site	Low	High	None	None	No Loss of Value
52-1-0128	Little River 3	Open Camp Site	High	High	Direct	Total	Total Loss of Value
52-1-0130	Tonalli Cove 1	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
52-1-0131	Tonalli Cove 2	Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
52-1-0133	Tonalli Cove 4	Open Camp Site	High	High	None	None	No Loss of Value
52-1-0136	Green Wattle Point	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
52-1-0141	Upper Wollondilly 2	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
52-1-0142	Kamilaroi Point	Shelter with Deposit and Art	High	High	None	None	No Loss of Value
52-1-0168	Joorilands Farm 1	Open Camp Site with Scarred Tree	High	High	None	None	No Loss of Value
52-1-0170	Joorilands Farm 2	Open Camp Site with Axe Grinding Grooves and Scarred Tree	High	High	None	None	No Loss of Value
52-1-0171	Joorilands Farm 3	Scarred Tree	High	High	None	None	No Loss of Value
52-1-0178	MF1	Shelter with Deposit	Low	High	None	None	No Loss of Value
52-1-0186	W223, Byrnes Creek	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
52-1-0236	Burra Lake Flake 1	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
52-1-0332	Byrnes Bay OS-1	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
52-1-0345	Green Wattle Point OS-1	Open Camp Site	High	High	Direct	Total	Total Loss of Value
52-1-0346	Joorilands OS-1	Open Camp Site	High	High	None	None	No Loss of Value
52-1-0352	Tonalli OS-1	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-00	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-01	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-02	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-03	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-05	Aboriginal Resource and Gathering	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-06	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-07	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-08	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-09	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-10	Shelter with Deposit	Moderate	High	None	None	No Loss of Value
Pending	Warragamba-11	Shelter with Deposit	Low	High	None	None	No Loss of Value
Pending	Warragamba-12	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-13	Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-14	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-15	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-16	Shelter with Art and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-17	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-18	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-19	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-20	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-21	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-22	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-23	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-24	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-25	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-26	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-27	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-28	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-29	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-30	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-31	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-32	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-33	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-34	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-35	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-36	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-37	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-38	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-39	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-40	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-41	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-42	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-43	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-44	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-45	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-46	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-47	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-48	Open Camp Site	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-49	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-50	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-51	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-52	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-53	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-54	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-55	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-56	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-57	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-58	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-59	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-60	Shelter with Deposit and Art	Low	High	None	None	No Loss of Value
Pending	Warragamba-61	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-62	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-63	Water Hole	Moderate	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-64	Isolated Artefact	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-65	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-66	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-67	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-68	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-69	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-70	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-71	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-72	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-73	Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-74	Water hole and Aboriginal Ceremony and Dreaming	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-75	Aboriginal Resource and Gathering	High	High	None	None	No Loss of Value
Pending	Warragamba-76	Scarred Tree	Low	High	None	None	No Loss of Value
Pending	Warragamba-77	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-78	Isolated Artefact	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-79	Open Camp Site with Scarred Tree	Low	High	None	None	No Loss of Value
Pending	Warragamba-80	Stone Arrangement	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-81	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-82	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-83	Axe Grinding Grooves	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-84	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-85	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-86	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-88	Isolated Artefact	Moderate	High	Direct	Total	Total Loss of Value
Pending	Warragamba-89	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-90	Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-91	Scarred Tree	Low	High	None	None	No Loss of Value
Pending	Warragamba-92	Stone Arrangement	Low	High	None	None	No Loss of Value
Pending	Warragamba-93	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-94	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-95	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-96	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-97	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-98	Open Camp Site	Low	High	Direct	Total	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-99	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-100	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-101	Isolated Artefact	Moderate	High	Direct	Total	Total Loss of Value
Pending	Warragamba-102	Isolated Artefact	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-103	Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-104	Shelter with Deposit and Artefacts	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-105	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-106	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-107	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-108	Isolated Artefact	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-109	Open Camp Site	Low	High	Indirect	Partial	Total loss of Value
Pending	Warragamba-110	Open Camp Site	High	High	Direct	Total	Total Loss of Value
Pending	Warragamba-111	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-112	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-113	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-114	Axe Grinding Grooves	Moderate	High	Direct	Total	Total Loss of Value
Pending	Warragamba-115	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-116	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	High	High	None	None	No Loss of Value
Pending	Warragamba-117	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-118	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-119	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-121	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-122	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-123	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-124	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-125	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-126	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-127	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-128	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-129	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-130	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-131	Shelter with Deposit, Art, and Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-132	Shelter with Deposit and Artefacts	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-133	Water Hole	High	High	None	None	No Loss of Value
Pending	Warragamba-134	Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-135	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-136	Shelter with Deposit	Low	High	None	None	No Loss of Value
Pending	Warragamba-137	Open Camp Site	Moderate	High	None	None	No Loss of Value
Pending	Warragamba-138	Open Camp Site	Low	High	Direct	Total	Total loss of Value
Pending	Warragamba-139	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-140	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-141	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-142	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-143	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-144	Shelter with Art	Low	High	None	None	No Loss of Value
Pending	Warragamba-145	Shelter with Deposit, Art, and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-146	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-147	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-148	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-149	Shelter with Deposit and Artefacts	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-150	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-151	Open Camp Site with Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-152	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-153	Scarred Tree	Low	High	None	None	No Loss of Value
Pending	Warragamba-154	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-155	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-156	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-157	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-158	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-159	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-160	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-161	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-162	Isolated Artefact	Low	High	None	None	No Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-163	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-164	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-165	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-166	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-167	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-168	Open Camp Site with Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-169	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-170	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-171	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-172	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-173	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-174	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-175	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-176	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-177	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-178	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-179	Aboriginal Resource and Gathering	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-180	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-181	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-182	Shelter with Deposit, Art, and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-183	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-184	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-185	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-186	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-187	Shelter with Deposit	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-188	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-189	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-191	Open Camp Site with Axe Grinding Grooves and Isolated Artefact	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-192	Shelter with Deposit	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-193	Shelter with Art	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-194	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-195	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-196	Open Camp Site with Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-197	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-198	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-199	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-200	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-201	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-202	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-203	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-204	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-205	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-206	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-207	Shelter with Deposit and Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-208	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-209	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-210	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-211	Shelter with Deposit, Art, and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-212	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-213	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-214	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-215	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-216	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-217	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-218	Open Camp Site with Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-219	Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-220	Open Camp Site with Scarred Tree	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-221	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-222	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-223	Shelter with Art and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-224	Shelter with Deposit and Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-225	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-226	Aboriginal Ceremony and Dreaming	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-227	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-228	Axe Grinding Grooves	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-229	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-230	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-231	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-232	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-233	Aboriginal Resource and Gathering	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-234	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-235	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-236	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-237	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-238	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-239	Shelter with Deposit and Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-240	Shelter with Deposit, Art, and Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-241	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-242	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-243	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-244	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-245	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-246	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-247	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-248	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-249	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-250	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-251	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-252	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-253	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-254	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-255	Open Camp Site	Moderate	High	None	None	No Loss of Value
Pending	Warragamba-256	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-257	Shelter with Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-258	Shelter with Artefacts and Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-259	Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-260	Shelter with Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-261	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-262	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-263	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-264	Open Camp Site	Moderate	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-265	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-266	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-267	Open Camp Site with Axe Grinding Grooves	High	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-268	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-269	Isolated Artefact	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-271	Open Camp Site	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-272	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-273	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-274	Shelter with Art and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-275	Shelter with Art and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-276	Shelter with Deposit, Art, and Isolated Artefact	Low	High	None	None	No Loss of Value
Pending	Warragamba-277	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-278	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-279	Shelter with Art	Low	High	None	None	No Loss of Value
Pending	Warragamba-280	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-281	Shelter with Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-282	Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-283	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-284	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-285	Shelter with Art and Axe Grinding Grooves	High	High	None	None	No Loss of Value
Pending	Warragamba-286	Shelter with Deposit and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-287	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-288	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	High	High	None	None	No Loss of Value
Pending	Warragamba-289	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-290	Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-291	Axe Grinding Grooves	High	High	None	None	No Loss of Value
Pending	Warragamba-292	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Moderate	High	None	None	No Loss of Value
Pending	Warragamba-293	Open Camp Site	Low	High	None	None	No Loss of Value
Pending	Warragamba-294	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-295	Shelter with Deposit, Art, and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-296	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value
Pending	Warragamba-297	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value
Pending	Warragamba-298	Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-299	Shelter with Deposit and Artefacts	Low	High	Direct	Total	Total Loss of Value
Pending	Warragamba-300	Shelter with Deposit and Art	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-301	Shelter with Deposit and Artefacts	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-302	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-303	Open Camp Site	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-304	Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-305	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High	Indirect	Partial	Total Loss of Value
Pending	Warragamba-306	Shelter with Deposit and Artefacts	Low	High	None	None	No Loss of Value

AHIMS ID	Site Name	Site Type	Scientific Significance	Cultural significance	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value)[1]
Pending	Warragamba-307	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Low	High	None	None	No Loss of Value

[1] The code does not provide definitions for these categories; however, they are taken to mean:
Type of harm: Direct- the object will or may be subject to direct physical disturbance. Indirect- there may be secondary consequences from the activity, resulting in harm. None- neither the object nor its context will be altered.
Degree of harm: Total: the object(s) will be directly harmed in their entirety. Partial- some objects will be directly or indirectly harmed, however a portion of a site may remain unaffected. None- there will be no harm.
Consequence of harm: Total loss of value- no heritage values will remain after the harm. Partial loss of value- some heritage values will remain after the harm. No loss of value- there will be no harm, and no loss of value.

Table 60: Summary of Potential Impacts of the Project on Aboriginal Heritage Sites

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
45-4-0186	Policeman's Point	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Subject Area	N	Y
45-4-0187	Kedumba; Kedumba Crossing	Open Camp Site	Outside the Subject Area	N	N
45-4-0191	Grahams Landing	Open Camp Site	Within the EUIA	Y	Y
45-4-0930	CA 1; Warragamba Dam Special Area	Open Camp Site	Within the EUIA	Y	Y
45-4-0931	EH 1; Warragamba Special Area	Open Camp Site	Within the EUIA	Y	Y
45-4-0946	TR 1	Open Camp Site	Within the EUIA	Y	Y
45-4-0948	GW5	Open Camp Site	Outside the Subject Area	N	N
45-4-0966	Ashtons 1	Axe Grinding Grooves	Outside the Subject Area	N	N
45-4-0967	RC1	Open Camp Site	Subject Area	N	Y
45-4-0983	JUNCTION POINT 1	Open Camp Site	Outside the Subject Area	N	N
45-4-0997	Bimlow PAD	Shelter with Art, Artefacts and Axe Grinding Grooves	Within the EUIA	Y	Y
52-1-0045	Jooriland Creek, Upper Burragorang	Axe Grinding Grooves	Subject Area	N	Y
52-1-0126	Little River 1	Open Camp Site	Outside the Subject Area	N	N
52-1-0127	Little River 2	Open Camp Site	Outside the Subject Area	N	N
52-1-0128	Little River 3	Open Camp Site	Subject Area	N	Y
52-1-0130	Tonalli Cove 1	Open Camp Site	Within the EUIA	Y	Y
52-1-0131	Tonalli Cove 2	Scarred Tree	Outside the Subject Area	N	N
52-1-0133	Tonalli Cove 4	Open Camp Site	Outside the Subject Area	N	N
52-1-0136	Green Wattle Point	Open Camp Site	Within the EUIA	Y	Y
52-1-0141	Upper Wollondilly 2	Open Camp Site	Outside the Subject Area	N	N
52-1-0142	Kamilaroi Point	Shelter with Deposit and Art	Outside the Subject Area	N	N
52-1-0168	Joorilands Farm 1	Open Camp Site with Scarred Tree	Outside the Subject Area	N	N
52-1-0170	Joorilands Farm 2	Open Camp Site with Axe Grinding Grooves and Scarred Tree	Outside the Subject Area	N	N
52-1-0171	Joorilands Farm 3	Scarred Tree	Outside the Subject Area	N	N
52-1-0178	MF1	Shelter with Deposit	Outside the Subject Area	N	N
52-1-0186	W223, Byrnes Creek	Open Camp Site	Within the EUIA	Y	Y
52-1-0236	Burra Lake Flake 1	Open Camp Site	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
52-1-0332	Byrnes Bay OS-1	Open Camp Site	Within the EUIA	Y	Y
52-1-0345	Green Wattle Point OS-1	Open Camp Site	Within the EUIA	Y	Y
52-1-0346	Joorilands OS-1	Open Camp Site	Outside the Subject Area	N	N
52-1-0352	Tonalli OS-1	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-00	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-01	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-02	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-03	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-05	Aboriginal Resource and Gathering	Within the EUIA	Y	Y
Pending	Warragamba-06	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-07	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-08	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-09	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-10	Shelter with Deposit	Outside the Subject Area	N	N
Pending	Warragamba-11	Shelter with Deposit	Outside the Subject Area	N	N
Pending	Warragamba-12	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-13	Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-14	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-15	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-16	Shelter with Art and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-17	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-18	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-19	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-20	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-21	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-22	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-23	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-24	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-25	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-26	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-27	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-28	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-29	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-30	Open Camp Site	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-31	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-32	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-33	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-34	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-35	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-36	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-37	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-38	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-39	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-40	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-41	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-42	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-43	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-44	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-45	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-46	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-47	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-48	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-49	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-50	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-51	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-52	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-53	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-54	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-55	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-56	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-57	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-58	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-59	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-60	Shelter with Deposit and Art	Outside the Subject Area	N	N
Pending	Warragamba-61	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-62	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-63	Water Hole	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-64	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-65	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-66	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-67	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-68	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-69	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-70	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-71	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-72	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-73	Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-74	Water hole and Aboriginal Ceremony and Dreaming	Within the EUIA	Y	Y
Pending	Warragamba-75	Aboriginal Resource and Gathering	Outside the Subject Area	N	N
Pending	Warragamba-76	Scarred Tree	Outside the Subject Area	N	N
Pending	Warragamba-77	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-78	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-79	Open Camp Site with Scarred Tree	Outside the Subject Area	N	N
Pending	Warragamba-80	Stone Arrangement	Subject Area	N	Y
Pending	Warragamba-81	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-82	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-83	Axe Grinding Grooves	Subject Area	N	Y
Pending	Warragamba-84	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-85	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-86	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-88	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-89	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-90	Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-91	Scarred Tree	Outside the Subject Area	N	N
Pending	Warragamba-92	Stone Arrangement	Outside the Subject Area	N	N
Pending	Warragamba-93	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-94	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-95	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-96	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-97	Open Camp Site	Outside the Subject Area	N	N

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-98	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-99	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-100	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-101	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-102	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-103	Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-104	Shelter with Deposit and Artefacts	Subject Area	N	Y
Pending	Warragamba-105	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-106	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-107	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-108	Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-109	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-110	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-111	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-112	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-113	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-114	Axe Grinding Grooves	Subject Area	N	Y
Pending	Warragamba-115	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-116	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-117	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-118	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-119	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-121	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-122	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-123	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-124	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-125	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-126	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-127	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-128	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-129	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-130	Isolated Artefact	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-131	Shelter with Deposit, Art, and Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-132	Shelter with Deposit and Artefacts	Subject Area	N	Y
Pending	Warragamba-133	Water Hole	Outside the Subject Area	N	N
Pending	Warragamba-134	Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-135	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-136	Shelter with Deposit	Outside the Subject Area	N	N
Pending	Warragamba-137	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-138	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-139	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-140	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-141	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-142	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-143	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-144	Shelter with Art	Outside the Subject Area	N	N
Pending	Warragamba-145	Shelter with Deposit, Art, and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-146	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-147	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-148	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-149	Shelter with Deposit and Artefacts	Subject Area	N	Y
Pending	Warragamba-150	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-151	Open Camp Site with Scarred Tree	Within the EUIA	Y	Y
Pending	Warragamba-152	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-153	Scarred Tree	Outside the Subject Area	N	N
Pending	Warragamba-154	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-155	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-156	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-157	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-158	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-159	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-160	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-161	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-162	Isolated Artefact	Outside the Subject Area	N	N

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-163	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-164	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-165	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-166	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-167	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-168	Open Camp Site with Scarred Tree	Within the EUIA	Y	Y
Pending	Warragamba-169	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-170	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-171	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-172	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-173	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-174	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-175	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-176	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-177	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-178	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-179	Aboriginal Resource and Gathering	Within the EUIA	Y	Y
Pending	Warragamba-180	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-181	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-182	Shelter with Deposit, Art, and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-183	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-184	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-185	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-186	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-187	Shelter with Deposit	Subject Area	N	Y
Pending	Warragamba-188	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-189	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-191	Open Camp Site with Axe Grinding Grooves and Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-192	Shelter with Deposit	Within the EUIA	Y	Y
Pending	Warragamba-193	Shelter with Art	Subject Area	N	Y
Pending	Warragamba-194	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-195	Open Camp Site	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-196	Open Camp Site with Scarred Tree	Within the EUIA	Y	Y
Pending	Warragamba-197	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-198	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-199	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-200	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-201	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-202	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-203	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-204	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-205	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-206	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-207	Shelter with Deposit and Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-208	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-209	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-210	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-211	Shelter with Deposit, Art, and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-212	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-213	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-214	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-215	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-216	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-217	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-218	Open Camp Site with Scarred Tree	Within the EUIA	Y	Y
Pending	Warragamba-219	Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-220	Open Camp Site with Scarred Tree	Within the EUIA	Y	Y
Pending	Warragamba-221	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-222	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-223	Shelter with Art and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-224	Shelter with Deposit and Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-225	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-226	Aboriginal Ceremony and Dreaming	Within the EUIA	Y	Y
Pending	Warragamba-227	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-228	Axe Grinding Grooves	Subject Area	N	Y
Pending	Warragamba-229	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-230	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-231	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-232	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-233	Aboriginal Resource and Gathering	Subject Area	N	Y
Pending	Warragamba-234	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-235	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-236	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-237	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-238	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-239	Shelter with Deposit and Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-240	Shelter with Deposit, Art, and Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-241	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-242	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-243	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-244	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-245	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-246	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-247	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-248	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-249	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-250	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-251	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-252	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-253	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-254	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-255	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-256	Open Camp Site	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-257	Shelter with Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-258	Shelter with Artefacts and Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-259	Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks	Within the EUIA	Y	Y
Pending	Warragamba-260	Shelter with Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-261	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-262	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-263	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-264	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-265	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-266	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-267	Open Camp Site with Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-268	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-269	Isolated Artefact	Within the EUIA	Y	Y
Pending	Warragamba-271	Open Camp Site	Subject Area	N	Y
Pending	Warragamba-272	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-273	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-274	Shelter with Art and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-275	Shelter with Art and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-276	Shelter with Deposit, Art, and Isolated Artefact	Outside the Subject Area	N	N
Pending	Warragamba-277	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-278	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-279	Shelter with Art	Outside the Subject Area	N	N
Pending	Warragamba-280	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-281	Shelter with Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-282	Axe Grinding Grooves	Within the EUIA	Y	Y

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-283	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-284	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-285	Shelter with Art and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-286	Shelter with Deposit and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-287	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-288	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-289	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-290	Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-291	Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-292	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-293	Open Camp Site	Outside the Subject Area	N	N
Pending	Warragamba-294	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-295	Shelter with Deposit, Art, and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-296	Shelter with Deposit, Art, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N
Pending	Warragamba-297	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N
Pending	Warragamba-298	Shelter with Deposit, Axe Grinding Grooves, and Isolated Artefact	Subject Area	N	Y
Pending	Warragamba-299	Shelter with Deposit and Artefacts	Subject Area	N	Y
Pending	Warragamba-300	Shelter with Deposit and Art	Within the EUIA	Y	Y
Pending	Warragamba-301	Shelter with Deposit and Artefacts	Within the EUIA	Y	Y
Pending	Warragamba-302	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-303	Open Camp Site	Within the EUIA	Y	Y
Pending	Warragamba-304	Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-305	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Within the EUIA	Y	Y
Pending	Warragamba-306	Shelter with Deposit and Artefacts	Outside the Subject Area	N	N

AHIMS ID	Site Name	Site Type	Location	Site Currently Impacted due to flooding (EUIA)/construction: Y/N	Additional flooding/construction impact for site due to this project (PUIA): Y/N
Pending	Warragamba-307	Shelter with Deposit, Artefacts and Axe Grinding Grooves	Outside the Subject Area	N	N

12.5 Potential Cumulative Impacts

The Project would cause an increase to the cumulative development impact on the Aboriginal cultural heritage of the region and local area. The Aboriginal heritage of the area has had moderate impacts to it due to past bushfires, the original development of the Warragamba Dam and the area being used as a water catchment for the past 60 years. Sites that have been impacted include:

1) Sites around Warragamba Dam that would have been impacted by the original construction of the dam due to vegetation clearance and earthworks for the development of the existing dam wall, boat ramp, spillways, and associated infrastructure

2) Sites within the EUIA including below the FSL of Lake Burragorang – which can experience flooding for long periods of time especially when the lake water levels are high

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) defines ecologically sustainable development and inter-generational equity as follows, "the principle of inter-generational equity holds that the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations". When considered against the principles of inter-generational equity and ecologically sustainable development, the potential impacts of the Project can be considered relatively minor.

There are predicted to be 578 archaeological sites (including 183 known sites) within the EUIA including below FSL that have previously been impacted by the development of the dam. It is recognised that with the Project, these sites would experience a greater duration of temporary inundation. The Project is predicted to affect a 174 sites (including 43 known sites) within the PUIA. The construction works will not harm any known Aboriginal sites. Flooding in the Subject Area above the PUIA is an extreme and rare event.

12.5.1 Potential Cumulative Impacts – Warragamba Dam Existing Operations

There have been 183 sites that were assessed during this survey program that have been impacted by the FSL and temporary inundation from the existing dam. As a result, these sites have been affected by varying levels and lengths of time submerged in water. At a number of rock art sites this has seen water wear and algae growth within the shelter where art, deposit, artefacts and/or axe grinding grooves may have once been present (Plate 28).

Artefact deposits and surface artefacts may have suffered exposure and movement due to the varying tides and environmental factors associated with the existing dams stored water (Plate 29).

Previously AHIMS registered Byrnes Creek (AHIMS ID#52-1-0008) which comprises of a sandstone platform with Engraving was unable to relocated during this assessment due to the movement of soils relating to water movement that have covered its registered location.

The Project is seen by the RAPs as a further accumulation of impacts to Aboriginal cultural heritage that has previously been affected by the original development of the Warragamba Dam.

Table 61: Aboriginal sites located within the EUIA that have already been harmed by incremental flooding

AHIMS-ID	Site Name	Site Type
45-4-0191	Grahams Landing	Open Camp Site
45-4-0930	CA 1; Warragamba Dam Special Area	Open Camp Site
52-1-0130	Tonalli Cove 1	Open Camp Site

AHIMS-ID	Site Name	Site Type
45-4-0191	Grahams Landing	Open Camp Site
52-1-0136	Green Wattle Point	Open Camp Site
52-1-0178	MF1	Shelter with Deposit
52-1-0236	Burra Lake Flake 1	Open Camp Site
52-1-0332	Byrnes Bay OS-1	Open Camp Site
52-1-0345	Green Wattle Point OS-1	Open Camp Site
Pending	Warragamba-15	Open Camp Site
Pending	Warragamba-16	Shelter with Art and Artefacts
Pending	Warragamba-17	Open Camp Site
Pending	Warragamba-18	Open Camp Site
Pending	Warragamba-19	Open Camp Site
Pending	Warragamba-20	Open Camp Site
Pending	Warragamba-25	Open Camp Site
Pending	Warragamba-27	Open Camp Site
Pending	Warragamba-28	Open Camp Site
Pending	Warragamba-30	Open Camp Site
Pending	Warragamba-34	Open Camp Site
Pending	Warragamba-41	Open Camp Site
Pending	Warragamba-63	Water Hole
Pending	Warragamba-77	Isolated Artefact
Pending	Warragamba-82	Open Camp Site
Pending	Warragamba-84	Shelter with Deposit and Artefacts
Pending	Warragamba-85	Open Camp Site
Pending	Warragamba-86	Open Camp Site
Pending	Warragamba-109	Open Camp Site
Pending	Warragamba-123	Open Camp Site
Pending	Warragamba-130	Isolated Artefact
Pending	Warragamba-145	Shelter with Deposit, Art, and Artefacts
Pending	Warragamba-146	Open Camp Site
Pending	Warragamba-151	Open Camp Site with Scarred Tree
Pending	Warragamba-152	Open Camp Site
Pending	Warragamba-157	Open Camp Site
Pending	Warragamba-173	Open Camp Site
Pending	Warragamba-177	Open Camp Site
Pending	Warragamba-188	Open Camp Site
Pending	Warragamba-192	Shelter with Deposit
Pending	Warragamba-197	Open Camp Site
Pending	Warragamba-204	Open Camp Site
Pending	Warragamba-210	Open Camp Site
Pending	Warragamba-213	Open Camp Site

AHIMS-ID	Site Name	Site Type
45-4-0191	Grahams Landing	Open Camp Site
Pending	Warragamba-215	Open Camp Site
Pending	Warragamba-218	Open Camp Site with Scarred Tree
Pending	Warragamba-220	Open Camp Site with Scarred Tree
Pending	Warragamba-222	Open Camp Site
Pending	Warragamba-226	Aboriginal Ceremony and Dreaming
Pending	Warragamba-227	Open Camp Site
Pending	Warragamba-231	Open Camp Site
Pending	Warragamba-237	Open Camp Site
Pending	Warragamba-241	Open Camp Site
Pending	Warragamba-242	Open Camp Site
Pending	Warragamba-244	Open Camp Site
Pending	Warragamba-245	Open Camp Site
Pending	Warragamba-246	Shelter with Deposit and Artefacts
Pending	Warragamba-247	Open Camp Site
Pending	Warragamba-249	Open Camp Site
Pending	Warragamba-250	Open Camp Site
Pending	Warragamba-253	Open Camp Site
Pending	Warragamba-258	Shelter with Artefacts and Axe Grinding Grooves
Pending	Warragamba-259	Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks
Pending	Warragamba-260	Shelter with Isolated Artefact
Pending	Warragamba-265	Open Camp Site
Pending	Warragamba-267	Open Camp Site with Axe Grinding Grooves
Pending	Warragamba-282	Axe Grinding Grooves
Pending	Warragamba-290	Axe Grinding Grooves
52-1-0345	Green Wattle Point OS-1	Open Camp Site
Pending	Warragamba-15	Open Camp Site
Pending	Warragamba-16	Shelter with Art and Artefacts
Pending	Warragamba-17	Open Camp Site
Pending	Warragamba-18	Open Camp Site
Pending	Warragamba-19	Open Camp Site
Pending	Warragamba-20	Open Camp Site
Pending	Warragamba-20	Open Camp Site
Pending	Warragamba-25	Open Camp Site
Pending	Warragamba-27	Open Camp Site
Pending	Warragamba-28	Open Camp Site
Pending	Warragamba-30	Open Camp Site
Pending	Warragamba-34	Open Camp Site

AHIMS-ID	Site Name	Site Type
45-4-0191	Grahams Landing	Open Camp Site
Pending	Warragamba-41	Open Camp Site
Pending	Warragamba-63	Water Hole
Pending	Warragamba-77	Isolated Artefact
Pending	Warragamba-82	Open Camp Site
Pending	Warragamba-84	Shelter with Deposit and Artefacts
Pending	Warragamba-85	Open Camp Site
Pending	Warragamba-86	Open Camp Site
Pending	Warragamba-109	Open Camp Site
Pending	Warragamba-123	Open Camp Site
Pending	Warragamba-130	Isolated Artefact
Pending	Warragamba-145	Shelter with Deposit, Art, and Artefacts
Pending	Warragamba-146	Open Camp Site
Pending	Warragamba-151	Open Camp Site with Scarred Tree
Pending	Warragamba-152	Open Camp Site
Pending	Warragamba-157	Open Camp Site
Pending	Warragamba-173	Open Camp Site
Pending	Warragamba-177	Open Camp Site
Pending	Warragamba-188	Open Camp Site
Pending	Warragamba-192	Shelter with Deposit
Pending	Warragamba-197	Open Camp Site
Pending	Warragamba-204	Open Camp Site
Pending	Warragamba-210	Open Camp Site
Pending	Warragamba-213	Open Camp Site
Pending	Warragamba-215	Open Camp Site
Pending	Warragamba-218	Open Camp Site with Scarred Tree
Pending	Warragamba-220	Open Camp Site with Scarred Tree
Pending	Warragamba-222	Open Camp Site
Pending	Warragamba-226	Aboriginal Ceremony and Dreaming
Pending	Warragamba-227	Open Camp Site
Pending	Warragamba-231	Open Camp Site
Pending	Warragamba-237	Open Camp Site
Pending	Warragamba-241	Open Camp Site
Pending	Warragamba-242	Open Camp Site
Pending	Warragamba-244	Open Camp Site
Pending	Warragamba-245	Open Camp Site
Pending	Warragamba-246	Shelter with Deposit and Artefacts
Pending	Warragamba-247	Open Camp Site
Pending	Warragamba-249	Open Camp Site
Pending	Warragamba-250	Open Camp Site

AHIMS-ID	Site Name	Site Type
45-4-0191	Grahams Landing	Open Camp Site
Pending	Warragamba-253	Open Camp Site
Pending	Warragamba-258	Shelter with Artefacts and Axe Grinding Grooves
Pending	Warragamba-259	Shelter with Deposit, Artefacts, Axe Grinding Grooves, and Tool Marks
Pending	Warragamba-260	Shelter with Isolated Artefact
Pending	Warragamba-265	Open Camp Site
Pending	Warragamba-267	Open Camp Site with Axe Grinding Grooves
Pending	Warragamba-282	Axe Grinding Grooves
Pending	Warragamba-290	Axe Grinding Grooves

Plate 28: Warragamba 16 this site appears to have been subject to water wash and mineralisation from continuous fluctuations in the water levels of Lake Burragorang, and as such is in a very poor state of preservation.

Plate 29: RC 1AHIMS ID# 45-4-0967 demonstrates an example of a previously registered Aboriginal site comprising of an Open Camp Site that falls within the FSL. The original site card listed three areas with numerous artefacts. Only five artefacts were relocated during this assessment.

13. Management and mitigation measures

13.1 Conservation Principles and Management Framework

The two founding principles behind the Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW (OEH 2011:12) are ecologically sustainable development and intergenerational equity. These principles hold that "the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations".

The strong emphasis, as in the Burra Charter, is to quantify and understand the heritage values of a place, a site, or an object and exhaust avenues of avoiding harm to those values. If harm cannot be avoided, then there must be consideration and implementation of strategies to minimise harm (OEH 2011:13).

It follows that the hierarchy for consideration regarding management strategies available for surface stone artefacts and subsurface stone artefacts and areas of archaeological potential, fall into four general categories, in order of preference from a conservation perspective:

- avoidance and in-situ conservation
- partial avoidance and partial in-situ conservation (includes partial harm)
- harm caused with mitigating circumstances such as collection or salvage
- unmitigated harm.

The four general categories (described above) have been considered in the following subsections with regard to both direct impacts (e.g. surface disturbance) and indirect impacts (e.g. monitoring activities).

The management and mitigation measures have been prepared in consideration of comments received from the RAPs during the consultation process. These comments include those related to cultural considerations surrounding salvage works and the handling of artefactual materials, as well as the cultural significance of all sites. All comments received from the RAPs are considered in the ACHA Report.

13.1.1 Detailed Design to Avoid Harm

Chapter 4 of the EIS discusses the proposed options and alternatives that were considered for flood mitigation in the Hawkesbury-Nepean Valley including:

- Non-structural strategies: these do not alter flood levels but reduce the effects of flooding
- Floodplain works: localised physical works in the floodplain could be used to divert floodwaters from properties
- Drainage strategies: these lower flood levels by assisting floodwaters to escape from the floodplain
- Flood detention strategies: these temporarily store floodwaters on contributing rivers and thereby lower peak levels downstream
- Combined strategies: these combine some of the above approaches.

Criteria used to assess these options were based on reducing flood level peak, reducing risk to life, economic costs, and environmental impacts. Other alternatives and options either did not achieve sufficient flood mitigation or had unacceptable economic or environmental costs. Other measures to avoid harm include:

- provision of a 14m PUIA rather than a 20m Flood Mitigation Zone. While a 20m Flood Mitigation Zone would provide a greater reduction in flooding downstream compared to a 14m Flood Mitigation Zone, the greater environmental costs from the longer period and extent of upstream temporary inundation were a major factor in discounting this alternative
- emptying the PUIA as soon as practical. The one of the objectives of the discharge protocol for the Flood Mitigation Zone will include to minimise the duration and extent of upstream temporary inundation

During detailed design of the project and the development of the operating protocols for the Subject Area, it is recommended the proponent consider the known Aboriginal heritage sites and cultural values identified by this study. This process should include a consideration of whether or not the project and the operating protocols can be designed in a way that avoids harm, and if harm cannot be avoided that harm be caused to as few sites as possible, within existing design and operational constraints. Depending on the site type (e.g. artefact scatter or grinding groove) and scientific significance rating, further management measures such as archival recording and fencing may be undertaken prior to harm, in consultation with a suitably qualified archaeologist and representatives of the RAPs.

This approach is consistent with the HeritageNSW requirements of Ecologically Sustainable Development (ESD) and intergenerational equity.

13.1.2 Sites that cannot be avoided

An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed by a suitably qualified archaeologist in consultation with the RAPs to develop specific management protocols for those Aboriginal cultural heritage sites that will be harmed due to the proposed Project. The Aboriginal cultural heritage sites in the following sections should be included within this ACHMP.

13.1.3 Sandstone Shelter sites

All sandstone shelter sites and grinding grooves of moderate or higher significance should have baseline recording to a level which creates a detailed archival record and allows for the monitoring of inundation impacts. The baseline recording should include detailed scale drawing and photography of each site, and in some cases should include consideration of photogrammetry, giga-pixel photography and terrestrial laser scanning. As the Project spans a long operational life, this work should be undertaken progressively and the ACHMP should allow scope for the inclusion of new technologies (for both recording and mitigation) should these become available.

13.1.4 Scarred Trees

Scarred Trees account for five of the total number of Aboriginal sites identified during the assessment, none of these trees fall within the Project Subject Area and all are considered to be of low scientific significance. Each of these trees should be assessed by a qualified arborist to determine whether the wounding observed at each tree is the result of traditional Aboriginal activities. If these scars are determined to be of Aboriginal origin, then detailed recording (if not already undertaken) and update of their AHIMS registration should be completed.

13.1.5 Artefact Sites

The management recommendations made regarding artefact sites that will be impacted by the proposed development is to take no action unless they will be impacted by the proposed surface or ancillary infrastructure.

13.1.6 Warragamba-288 (AHIMS ID# pending)

Warragamba-288 (AHIMS ID #pending) which comprises of a sandstone shelter with hafted hatchet falls outside of the Subject Area. Due to its rarity and scientific significance rating of high; it is recommended that this site is included in the AHMP and additional recording and archaeological assessment is carried out to provide additional details on the age and mastic type used by the local Aboriginal people for hafting practices.

13.2 Gundungurra Indigenous Land Use Agreement (20 June 2014)

An Indigenous Land Use Agreement (ILUA) exists between the Gundungurra People and the NSW Government including Water NSW. The Agreement provides a framework for consultation and participation of the Gundungurra people in the management of the ILUA area which incorporates the Project Area.

The Gundungurra ILUA will be considered when implementing management and mitigation measures forthcoming from the Project.

13.3 Aboriginal Cultural Heritage Management Plan

An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed for the Project that details and schedules (for the life of the Project) the mitigation and management measures presented in this report, and any other relevant responsibilities and considerations.

The ACHMP must be developed, managed, and implemented in consultation with the RAPs and relevant regulatory authorities.

The ACHMP should include, but not be limited to the following:

- Protocols for the involvement of the RAPs in cultural heritage works conducted under the ACHMP. A communications protocol that describes clear methods of communication, including expectations of suitable notification and response time, between the proponent and the RAPs.
- Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
- Warragamba-288 (AHIMS ID #pending) should be included within the ACHMP
- A regular review process for the AHMP.
- Copies of the final ACHMP should be made available to each RAP, the DP&E, WaterNSW, NPWS and the Heritage NSW.

13.4 Evaluation of management and mitigation measures

The Project will result in unavoidable harm to sites of Aboriginal heritage, and potential harm to sites that may occur in areas that have not been subject to archaeological survey. The harm involves infrequent temporary inundation with floodwaters for periods of up to 10 days. For these sites and areas that will be temporarily inundated with floodwaters there are no feasible avoidance options that can be implemented by the project. Some direct measures to mitigate harm to these sites has been presented above. To further ameliorate these unavoidable impacts alternative measures that can positively influence ecologically

sustainable development and intergenerational equity principles are suggested. These are indirect mitigation measures which include measures to contribute to intergenerational equity through increasing the broader community's knowledge of Aboriginal history in the Warragamba area, and improve the Aboriginal community's ability to access and manage the valuable archaeological and cultural resource that exists within and beyond the project's boundary. The indirect mitigation measures are presented in the recommendations.

The mitigation measures developed as part of this assessment will not remove the potential for harm to the Aboriginal sites that they are applied to; but are designed to provide opportunities for additional RAP access and support greater interaction with cultural heritage values that the Aboriginal community have been rendered partially inaccessible due to colonisation and the flooding of the valley.

14. Recommendations

1. WaterNSW should continue consultation and engagement with the Registered Aboriginal Parties for the duration of the Project
2. An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed for the Project. The ACHMP should be developed and managed in consultation with the RAPs and relevant regulatory authorities. The ACHMP should include, but not be limited to the following:

    - Protocols for the involvement of the RAPs in cultural heritage investigations conducted under the ACHMP.
    - A communications protocol that describes clear methods of communication and expectations between the Parties to the plan.
    - Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
    - A regular review process for the ACHMP.
    - The inclusion of site Warragamba-288 (AHIMS ID #pending) in the ACHMP
3. The ACHMP should be written so as to management the recommendations below.
4. The unsurveyed portion of the Subject Area should be surveyed well prior to construction should the Project be approved
5. The unsurveyed portion of the area above the Subject Area should be sample surveyed to identify sites and places of high significance prior to construction should the Project be approved

    - For recommendations 4 and 5 survey should include provision for detailed recording of all shelter sites, including 3D photogrammetry, planning, detailed photography and scale drawing of any art or other features present
6. Further detailed impact assessment of all Aboriginal cultural heritage sites and places that are located within the Project PUIA, and sites of high significance in the area above the PUIA should be completed. The detailed assessment should include, but not be limited to:

    - Further detailed assessment of potential impacts through detailed recording of site or place elevation
    - Site or place-specific hydrological modelling (expected frequency and duration of inundation at the specific site or place location)
    - An informed impact assessment to guide further management strategies (assessing risks of erosion, for example).
    - Depending on the outcomes of site-specific assessment
        - Test excavation be completed at those rockshelter sites and open sites with sufficient soil profiles to understand the potential of archaeological deposit
        - Appropriately detailed analysis of any artefacts or samples recovered during test excavations
        - Appropriate recording of axe grinding grooves, engraving sites or other open sites
7. Prior to the operation of the Project, WaterNSW will review its assessment processes for works within the upstream catchment to include awareness to personnel undertaking an activity on its behalf of any potential Aboriginal cultural heritage values and objects in the area.
8. Protocols for heritage awareness training to be incorporated into the site inductions for both employees and sub-contractors involved in the construction of the Project, operation of the dam and activities in the catchment of Lake Burragorang. Registered Aboriginal Parties should be involved in the development and presentation of the cultural awareness training.

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Annex 1: Aboriginal heritage site information

List of Annex 1 Sub-sections:

Annex 2: Supporting figures

Annex 3: AHIMS results

Annex 4: Food sources available to Aboriginal people

Annex 5: Scientific significance of Aboriginal sites

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Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)