

Sydney Zoo Bungarribee Precinct

Aboriginal Cultural Heritage
Assessment Report

Report to Sydney Zoo

June 2016



 artefact

Artefact Heritage
ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pymont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au

EXECUTIVE SUMMARY

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

NSW Department of Planning and Environment (DPE) has declared the project a State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

In accordance with the SEARs, Artefact Heritage was engaged by Sydney Zoo to conduct an Aboriginal heritage assessment of the proposal site (the study area). That assessment was prepared in 2015 and identified the location of three previously recorded Aboriginal sites located within the study area and two areas of potential archaeological deposit (PAD), SZ PAD01 and SZ PAD02. The three previously recorded sites were considered to be of low archaeological significance and no further archaeological investigation was recommended. Based on previous subsurface archaeological investigations within the Bungarribee Precinct salvage excavation was recommended where there would be significant impacts to SZ PAD01. Archaeological test excavation in accordance with the OEH 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010) (herein the OEH Code of Practice) was recommended for SZ PAD02.

Following the preparation of a test excavation methodology (Artefact Heritage 2016) and consultation with the Aboriginal community a test excavation program was conducted within SZ PAD02 over four days between 26 April and 29 April 2016. Further details of Aboriginal stakeholder consultation and participation in the test excavation program is outlined in the Archaeological Test Excavation Report in Appendix E.

The test excavation identified two low density dispersed artefact scatters within SZ PAD02. These sites, SZ AS01 (#45-5-4772) and SZ AS02 (#45-5-4771) were assessed as demonstrating low archaeological significance and no further investigation was recommended.

Artefact Heritage has prepared this ACHAR in accordance with the OEH *Guide to Investigating and Reporting on Aboriginal Cultural Heritage in NSW 2010* (herein referred to as the Guide). This report addresses the requirements of the Secretary of the NSW Department of Planning and Environment (the Secretary's Environmental Assessment Requirements [SEARs] (SSD 7228)). The heritage specific SEARs provided for the proposal are listed in Section 1.4.

The objectives of this ACHAR are to:

- Assess the Aboriginal cultural heritage values of the study area, including archaeological and community cultural values, and the significance of identified values
- Identify Aboriginal cultural heritage values that may be impacted by the proposal, including consideration of cumulative impacts, and measures to avoid significant impacts
- Ensure appropriate Aboriginal community consultation in the assessment process
- Identify any recommended further investigations, mitigation and management measures should the project proceed.

Overview of findings

- A total of five Aboriginal sites were identified during the ASR and test excavation investigations.
- One area of PAD (SZ PAD01) was identified adjacent to the Eastern Creek corridor.
- The proposal would impact the five Aboriginal sites (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771). These sites have been assessed as demonstrating low archaeological significance.
- The proposal would impact very small portions of SZ PAD01. These impacts would be limited to the introduction of fill along the eastern margin of the PAD area.

Recommendations

- No further archaeological investigation is required at the five sites that have been assessed as demonstrating low archaeological significance (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771).
- Based on the most recent designs received by Artefact Heritage no further works are required within SZ PAD01. If the designs are to change and result in additional impacts to this area further archaeological investigation and possible salvage may be required.
- An appropriate reburial location for artefacts recovered during test excavation would be chosen based on consultation with registered Aboriginal stakeholders, Sydney Zoo and the WSPT. A site update card should be forwarded to the OEH AHIMS Registrar with information on the location and depth of reburial.
- Site impact recording forms would be submitted to AHIMS for all five sites that would be impacted by the proposal (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771).
- Inadvertent impacts to those portions of SZ PAD01 outside the impact area, should be avoided by including information on its location in the CEMP. Where necessary fencing may be used to create an exclusion zone.
- A CEMP and accompanying unexpected finds procedure would provide a method to manage potential heritage constraints and unexpected finds during construction works. Aspects of site area protection that should be included in the CEMP include:
 - Establishing no-harm areas where appropriate.
 - Nature of the visual markers around no-harm areas. The CEMP should document what type of visual marker would be put in place, such as temporary fencing, high visibility tape, and temporary signage
 - Provide clear guidance to all site workers on access restrictions to no-harm areas.
 - Unexpected finds procedure, including procedures for human remains.
- Should any changes be made to the proposal boundary, these should be assessed by an archaeologist in consultation with the registered Aboriginal stakeholder groups and further investigation may be necessary

- This ACHAR and accompanying documentation should be forward to registered Aboriginal stakeholders, DPE and OEH.

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

NSW Department of Planning and Environment (DPE) has declared the project a State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

Artefact Heritage has been engaged by Sydney Zoo to prepare an Aboriginal Cultural Heritage Report (ACHAR) for the proposal in accordance with the SEARs (SSD 7228), the OEH *Guide to Investigating and Reporting on Aboriginal Cultural Heritage in NSW 2010* (herein referred to as the Guide) and the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW 2010* (herein referred to as the Code of Practice). Although the proposal is assessed as SSD the Guide and Code of Practice have been followed to ensure heritage best practice is met.

1.2 Objectives of this Aboriginal Cultural Heritage Assessment

The objectives of this report are to:

- Assess the Aboriginal cultural heritage values of the study area, including archaeological and community cultural values, and the significance of identified values
- Identify Aboriginal cultural heritage values that may be impacted by the proposal, including consideration of cumulative impacts, and measures to avoid significant impacts
- Ensure appropriate Aboriginal community consultation in the assessment process
- Identify any recommended further investigations, mitigation and management measures required, should the project proceed.

This report includes:

- A description of the scope of the project and the extent of the study area
- A description of the Aboriginal community involvement and Aboriginal consultation
- A significance assessment of the study area including cultural and archaeological values
- A description of the statutory requirements for the protection of Aboriginal heritage
- An impact assessment for recorded Aboriginal sites and areas of archaeological potential
- Provision of measures to avoid, minimise, and if necessary, offset the predicted impacts on Aboriginal heritage values.

1.3 Background to this Assessment

Artefact heritage was engaged by Sydney Zoo in 2015 to prepare an Archaeological Survey Report (ASR) to address the relevant SEARs in relation to the preparation of the Environmental Impact Statement (EIS) for the proposal.

The proposal site (herein the study area) is located in the southern portion of Lot 101/ DP1195067 within the Blacktown City Local Government Area (LGA). It is bound by Eastern Creek to the west, Doonside Road to the east and the Great Western Highway to the south (Figure 1). The study area is 16.5 hectares.

The ASR identified three previously recorded AHIMS sites within the study area and two previously unrecorded areas of potential archaeological deposit (PAD). The AHIMS sites were assessed to be of low archaeological significance and no further works were recommended. The PAD areas included the raised terrace adjacent to Eastern Creek in the western portion of the study area, SZ PAD01 and an intact crest landform located within the central portion of the study area, SZ PAD02.

Archaeological salvage was recommended for the sections of SZ PAD01 that would be impacted by the proposal. This recommendation was based on previous archaeological investigations within the Bungarribee Precinct that have identified high concentrations of artefacts adjacent to high order watercourses. Archaeological test excavation was recommended under the Code of Practice for SZ PAD02.

Following the preparation of a test excavation methodology and consultation with the Aboriginal community a test excavation program was conducted within SZ PAD02 over four days between 26 April and 29 April 2016. Further details of Aboriginal stakeholder consultation and participation in the test excavation program is outlined in the Archaeological Test Excavation Report attached as Appendix E.

The test excavation identified two dispersed low density artefact scatters at SZ PAD02. These sites were designated SZ AS01 (#45-5-4772) and SZ AS02 (#45-5-4771). Site SZ AS01 consists of 26 stone artefacts and site SZ AS02 consists of three stone artefacts. The archaeological significance of the sites was assessed as low. This assessment was based on the ubiquitous nature of low density artefact scatters across the Cumberland Plain and the low research potential of the sites due to their disturbed nature and absence of features. Therefore, no further works were recommended for SZ AS01 and SZ AS02.

1.4 Secretary's Environmental Assessment Requirements and Agency Requirements

The specific SEARs and agency requirements addressed in this report are summarised in Table 1 and Table 2 below. This ACHAR satisfies the requirements of the SEARs, Code of Practice and the Guide.

Table 1: Relevant SEARs

Assessment requirements	Where addressed in this report
An Aboriginal cultural heritage assessment prepared by a suitably qualified archaeologist (including cultural and archaeological significance) which must demonstrate effective consultation with relevant Aboriginal community groups	Section 2.0 – Consultation Process Section 4.0– Significance Assessment

Assessment requirements	Where addressed in this report
A non-Aboriginal cultural heritage assessment prepared by a suitably qualified archaeologist (including both cultural and archaeological significance) which must detail potential impacts on heritage assets and any proposed management and mitigation measures of the potential impacts of vibration on heritage items	A separate report has been compiled that addresses impacts to non-Aboriginal (historical) heritage (Artefact Heritage 2016)

Table 2: OEH Requirements

OEH requirements	Section
The EIS must identify and describe the tangible and intangible Aboriginal cultural heritage values that exist across the whole area that will be affected by the project and document these in the EIS. This may include the need for surface survey and test excavation. The identification of cultural heritage values should be guided by the <i>Guide to investigation, assessing and reporting on Aboriginal Cultural Heritage in NSW</i> (DECCW 2011)	Section 3.8 Results of Site Survey Section 3.9 Results of Test Excavation Section 4.0 Significance Assessment Section 5.0 Avoiding and Minimising Harm
Where Aboriginal cultural heritage are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> (DECCW). The significance of the cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.	Section 2.0 Consultation Process Appendix A: Consultation Log Appendix B: Newspaper Public Notice Appendix C: Consultation Documentation
Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH	Section 5.0 Avoiding and Minimising Harm

1.5 The Proposal

The proposal includes the development of the land within the study area into a world class zoo exhibiting a wide range of popular animal species (Figure 3). The facility would provide an immersive safari-like experience including open grassland areas, elevated walkways and boardwalks, reptile and nocturnal animal houses, aquarium and infrastructure to service 30+ exhibits. Education and conservation programs planned for the Zoo are intended to provide a focus on local heritage values including natural and Aboriginal heritage.

The following description of the proposal has been taken from Chapter 3.0 of the EIS (JBA 2015).

The proposed development of Sydney Zoo would include.

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals.
- Back-of-house buildings for exhibits.
- Main entrance building comprising entry/exit, and gift shop.
- Restaurant and café.
- Kiosks and amenities.
- Show arena.
- Picnic areas and gardens.
- Wetlands and waterways.
- Service building containing:
 - Administration areas;
 - Curatorial and food preparation areas; and
 - Veterinarian space.
- Signage
- Service yard with maintenance shelter.
- Internal services and utilities to support the Zoo, including water, sewer, electricity and telecommunications
- Main car park for approximately 475 vehicles, with an overflow car park for approximately 840 vehicles (accessed via an internal road connecting to the Great Western Highway)
- Bus and coach parking.
- Subdivision; and
- Landscaping of the site associated with all of the above.

There would be some site preparation works required prior to construction of the Zoo. These would include bulk earthworks to provide minor regrading of the site for development purposes, along with exhibit wall mounds and moats. All soil excavated on-site would be reused on-site to avoid the need for off-site removal of soil.

The earthworks would not fundamentally change the topography of the site but are intended to fine-tune levels to support the landscape outcomes. Approximately 13 600m³ of clean fill would be brought to the site to support landscaping. Fill will be virgin excavated natural material (VENM) or excavated natural material (ENM).

Construction of the project is expected to take approximately 8 – 12 months to complete.

Figure 1: Location of the study area

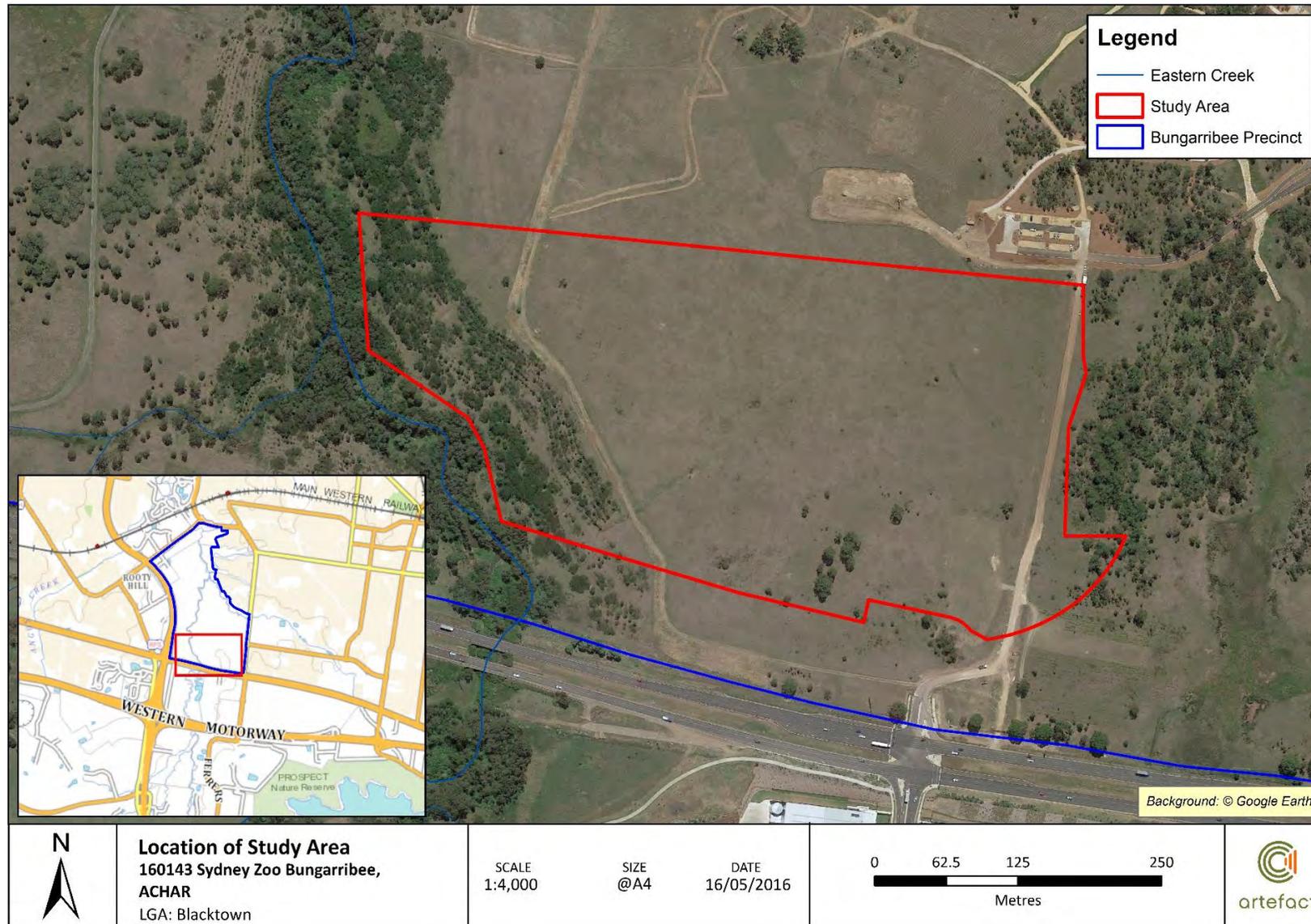


Figure 2: Overview of results

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1.6 Statutory Requirements

This ACHAR has been prepared in accordance with relevant legislative requirements, policies and procedural guidelines applicable to Aboriginal heritage and its protection in New South Wales.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides statutory protection to all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW). As the current project is being assessed as SSD under the EP&A Act, the approval requirements of the NPW Act would not apply if planning approval is granted.

To support effective implementation of the NPW Act, OEH has developed a range of guidelines addressing requirements for the undertaking of archaeological investigations, preparation of Aboriginal cultural heritage assessments and consultation with Aboriginal communities. The guidelines have been followed and applied in preparation of this ACHAR.

Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (the EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process.

As noted above, the proposal is being assessed under Part 4, Division 4.1 of the EP&A Act which establishes an assessment and approval regime for SSD. This ACHAR will inform and support the EIS in accordance with requirements issued by the Secretary of the Department of Planning and Environment.

1.7 Investigators and Contributors

This report was written by Claire Rayner and Veronica Norman (Heritage Consultants). Management input and final review was provided by Dr Sandra Wallace (Managing Director) and Josh Symons (Principal).

2.0 CONSULTATION PROCESS

Aboriginal community consultation has been guided by OEH *Aboriginal cultural heritage consultation requirements for proponents 2010* (consultation requirements). A consultation log has been maintained which details all correspondence with registered Aboriginal stakeholders. The consultation log is attached to this report as Appendix A. All of the documentation collected during the consultation for the proposal can be found in Appendix C.

In accordance with step 4.1.2 of the consultation requirements, Artefact Heritage corresponded with the following organisations by letter requesting the details of Aboriginal people who may hold cultural knowledge relevant to determining the Aboriginal cultural significance of Aboriginal objects and/or places within the Bungarribee Precinct:

- Regional Operations Group, Metropolitan Region, OEH
- Deerubbin Local Aboriginal Land Council (DLALC)
- The Registrar, *Aboriginal Land Rights Act 1983*
- National Native Title Tribunal
- NTSCORP
- Blacktown City Council
- Greater Sydney Catchment Management Authority

In accordance with Step 4.1.3 of the consultation requirements, an advertisement was placed in the Blacktown Sun on 30 June 2015. The advertisement invited all Aboriginal persons and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places in the subject land to register their interest by 5 August 2015. The newspaper notice is included as Appendix B.

In accordance with Step 4.1.3 of the consultation requirements, letters were sent to all Aboriginal persons or organisations identified through responses from agencies contacted as part of Step 4.1.2. The letters provided details about the location and nature of the proposal, as well as an invitation to register as an Aboriginal stakeholder.

Following the completion of steps 4.1.2 and 4.1.3 45 Aboriginal stakeholders registered as persons or organisations that may hold cultural knowledge relevant to determining the Aboriginal cultural values of the study area. The registered Aboriginal stakeholders are listed in Table 3.

In accordance with Step 4.1.6 of the OEH consultation requirements, a list of registered Aboriginal stakeholders and a copy of the published Step 4.1.3 advertisement were forwarded to both OEH Environment Protection and Regulation, and DLALC.

A copy of the excavation methodology and ACHAR methodology was forwarded to registered Aboriginal stakeholders on 17 March 2016 with a 28 day period for review and comment.

Comments on the methodologies were received by Artefact from Aboriginal Archaeological Services and Darug Land Observations. Both stakeholders supported the methodologies. No comments were forthcoming from the remainder of the registered stakeholders.

Test excavation was conducted under the Code of Practice with one supervisor, two archaeologists and three Aboriginal stakeholder representatives present each day. The details of stakeholder involvement are included in the ATER attached to this report as Appendix E.

3.0 SUMMARY AND ANALYSIS OF BACKGROUND INFORMATION

A summary of background information is included below. Comprehensive background information can be found in the ASR (Appendix D).

3.1 Environmental Context

The study area is located on the Cumberland Plain, which would once have been covered by open Cumberland Plain Woodland, typical of the Wianamatta Group shale geology. Tree species would have included Forest Red Gum (*E. tereticornis*), and Grey Box (*E. moluccana*) (Benson and Howell 1990). The original vegetation within the study area has mostly been cleared. The study area is located across crest, slope and flat landforms bordering Eastern Creek. The southern half of the study area is located across slopes associated with undulating terrain in the south eastern corner of the Bungarribee Precinct.

The primary soil type across the area is the Blacktown soil landscape, which generally consists of shallow duplex soils over a clay base. Overlying fluvial soils were associated with the alluvium across the low-lying terrain bordering Eastern Creek. The fluvial soils, called the South Creek soil landscape, are likely to be subject to frequent flood events. Eastern Creek is a major watercourse across the Cumberland Plain that flows north into South Creek in the Marsden Park area. Bungarribee Creek, to the north of the study area, is a second order watercourse that flows northwest from the Prospect area into Eastern Creek.

3.2 Aboriginal Histories of the Locality

Prior to the appropriation of their land by Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. It seems that territorial boundaries were fairly fluid, although details are not known. The language group spoken on the Cumberland Plain is known as Darug (Dharruk – alternative spelling). This term was used in Western literature for the first time in 1900 (Matthews & Everitt) as before the late 1800s language groups or dialects were not published (Attenbrow 2010:31). The Darug language group is thought to have extended from Appin in the south to the Hawkesbury River, west of the Georges River, Parramatta, the Lane Cove River and to Berowra Creek (Attenbrow 2010:34). This area was home to a number of different clan groups throughout the Cumberland Plain.

British colonisation had a profound and devastating effect on the Aboriginal population of the Sydney region, including Darug speakers. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources. Overall the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic over half of the Aboriginal people of the Sydney region died. The disease spread west to the Darug of the Cumberland Plain and north to the Hawkesbury. It may have in fact spread much further afield, over the Blue Mountains (Butlin 1983). This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them, or record their clan names (Karskens 2010:452).

The British initially thought that Aboriginal people did not live inland, but were confined to the coast taking advantage of the abundant marine resources available. The first major expeditions into the

interior did not witness any Aboriginal people, but evidence of their existence was noted. In April 1788 Governor Philip led an expedition west to Prospect Hill. It was noted,

'...that these parts are frequented by the natives was undeniably proved by the temporary huts which were seen in several places. Near one of these huts, the bones of kangaroo were found, and several trees where seen on fire' (Stockdale 1789).

In 1789 Captain Watkin Tench led an expedition to the Nepean River. He noted that:

Traces of the natives appeared at every step, sometimes in their hunting huts which consist of nothing more than a large piece of bark bent in the middle and opened at both ends, exactly resembling two cards set up to form an acute angle; sometimes in marks on trees which they had climbed; or in squirrel-traps....We also met with two old damaged canoes hauled up on the beach. (Tench 1789)

It wasn't until rural settlement began in the western Cumberland Plain, around 1791 that the colonists and Aboriginal people of that region came face to face. Relations quickly disintegrated, and tensions over land and resources escalated. Governor King sanctioned the shooting of Aboriginal people in a General Order made in 1801 (Kohen 1986:24). Intermittent killings on both sides continued for over 15 years, including the Appin massacre and attacks at South Creek in 1816 (Karskens 2010: 225, Kohen 1986:23).

Although tensions existed between Aboriginal people and Europeans on the Cumberland Plain, a number of Aboriginal families continued to live semi-traditional lives in the area. The first parcels of land granted to an Aboriginal person were to the north-west of the study area between Richmond Road and Plumpton Ridge along Bells Creek. Governor Macquarie granted this land to Colebee and Nurragingy in 1819. Colebee did not stay long but Nurragingy lived on the land and it remained in the family until 1920 when it was resumed by the Aboriginal Protection Board (Kohen 1986:27).

The government policy of removal of Aboriginal children from their parents in order to assimilate them into white society began fairly early on in the colony's history, and was epitomized by the development of the Native Institution at Parramatta in 1814. This facility was moved to the Black Town settlement in 1823 approximately six kilometres north-west of the current study area. It was closed in 1829 and the land was used for farming, but the site remains significant for its historical, archaeological and social values (GML 2010:36).

Into the nineteenth and twentieth centuries descendants of Darug language speakers continued to live in Western Sydney along with Aboriginal people from other areas of NSW. The Aboriginal groups in their comments on this study will address the contemporary cultural, social and spiritual meanings of the locality.

3.3 Historical Land Use

From 1802 the Bungarribee area formed part of the Rooty Hill Government Farm. While the focus of farm activities was north of the Bungarribee Precinct on Rooty Hill, the area had begun to be cleared to provide pasture for government herds. From 1822 the north eastern portion of the Precinct comprised a single grant to Colonel John Campbell who built a homestead and several outbuildings to the north of the Bungarribee Precinct. The Bungarribee Estate passed through a number of hands and was used as a horse stud (1828 to 1945) and as a remount depot for the East India Company for horses to be shipped to India for use by the British cavalry (1845 to 1846).

The north western portion of the Precinct was subdivided from the 1840s. These subdivisions fronted Belmore Street, east of the Bungarribee Precinct. The area within the Precinct comprised the back half of each subdivision and has been subject to a low level of disturbance, aside from the

construction of outbuildings. In the 1900s a dairy farm existed within the north western portion of the Precinct. The south western portion of the Precinct developed as part of the Eastern Creek village. From the 1880s a commercial strip fronted the Great Western Road and included a post office and a blacksmiths shop.

During World War II (WWII) the whole Bungarribee Precinct was resumed for use as a RAAF dispersal area. The dispersal area comprised a sealed landing strip, taxiways and hides (aircraft dispersal pads). Jo McDonald Cultural Heritage Management (JMcDCHM) (2007) suggests that the gravels used in the construction of the landing strip were sourced from Plumpton Ridge, about five kilometres northwest of the Precinct.

In the 1949 the Overseas Telecommunications Commission (OTC) resumed the Bungarribee precinct for use as a transmission station. A transmission station was built in the central portion of the Precinct and a series of transmission towers or aerials were erected across the OTC land holding. The OTC station was closed in the 1990s, telecommunication technologies having surpassed the need for radio transmission. The transmission towers were removed and the station demolished in 2001.

Previous land use has caused a moderate level of disturbance to the Precinct. The clearing of native vegetation between 1802 and circa 1840 has caused a moderate level of disturbance across the Precinct. There are also a number of isolated incidences of high disturbance, for example in the south and west where roads have been constructed and in the central portion of the Precinct where the RAAF landing strip, taxiways and hides and OTC transmission station were built.

3.4 Aboriginal Material Culture

Aboriginal people have lived in the Sydney area for more than 20,000 years. The oldest securely dated site in the greater Sydney region is 17,800 years before present (yBP), which was recorded in a rock shelter at Shaw's Creek (Nanson et al 1987). Evidence of Aboriginal occupation has been found dated to 50-60,000 yBP at Lake Mungo in NSW, so it is likely that Aboriginal people have lived in the Sydney region for even longer than indicated by the oldest recorded dates we have at present. The archaeological material record provides evidence of this long occupation, but also provides evidence of a dynamic culture that has changed through time.

The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts. Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000yBP in the Sydney region (Attenbrow 2010:102). It is argued that these changes in material culture were an indication of changes in social organisation and behaviour.

The Eastern Regional Sequence was first developed by McCarthy in 1948 to explain the typological differences he was seeing in stone tool technology in different stratigraphic levels during excavations such as Lapstone Creek near the foot of the Blue Mountains (McCarthy 1948). The sequence had three phases that corresponded to different technologies and tool types (the Capertian, Bondaian and Eloueran). The categories have been refined through the interpretation of further excavation data and radiocarbon dates (Hiscock & Attenbrow 2005, JMcDCHM 2005). It is now thought that prior to 8,500 yBP tool technology remained fairly static with a preference for silicified tuff, quartz and some unheated silcrete. Bipolar flaking was rare with unifacial flaking predominant. No backed artefacts have been found of this antiquity.

After 8,500 yBP silcrete was more dominant as a raw material, and bifacial flaking became the most common technique for tool manufacture. From about 4,000yBP to 1,000yBP backed artefacts appear

Table 5: Registered sites located within the study area

Figure 4: Distribution of AHIMS sites

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3.6 Previous Archaeological Investigations

A number of archaeological investigations have been conducted within the Bungarribee Precinct, including surveys by Jim Kohen as part of his PhD research in 1984 and as part of an investigation for Blacktown City Council in 1986, and more recent investigations by JMcD CHM (2006b; 2007; 2011). Several smaller investigations have also been undertaken within the Precinct and wider Parklands area as impact assessment studies and archaeological management studies (Haglund 1987; 2000; Navin Officer 1993; AMBS 2005; Artefact Heritage 2012).

JMcD CHM (2006-2011)

JMcD CHM's archaeological investigations into the Bungarribee Precinct included an initial survey and archaeological assessment (2006b), an Indigenous Heritage Impact Statement (2007), and archaeological excavation of a portion of potential archaeological deposit (PAD) identified in the earlier assessment (2011).

The initial survey and impact statement (2006b and 2007) identified that 52 recorded Aboriginal sites and five PADs were located across the Bungarribee Precinct. During that investigation the Precinct covered a much larger area than the current boundaries, and included both the Bunya residential area (previously referred to as the Doonside residential parcel) to the northeast, and the Bungarribee industrial estate area to the south of the Great Western Highway (previously referred to as the Huntingwood West Employment Lands).

JMcD CHM (2007) developed a Strategic Management Model (SMM) for the Precinct, which identified sites and sensitive landscapes within the Precinct. A significant portion of the Precinct was designated Zone 1 (good archaeological potential) and delineated as PAD WSP1 (see Figure 5). JMcD CHM recommended that Zone 1 areas were avoided and that a possible Aboriginal heritage conservation area declared. Other areas within the Precinct were assessed as Zone 3 (low archaeological potential). JMcD CHM recommended that there were no heritage constraints to development in those areas and no further archaeological works required. It is noted however, that Aboriginal stakeholders may want to monitor development within these areas, particularly along the creek lines.

Salvage excavation was recommended for portions of identified good and moderate archaeological potential that would be impacted by proposed development within Bungarribee Precinct (JMcD CHM 2007: 39).

Figure 5: Location of PAD WSP1 within Bungarribee Precinct, yellow indicates good potential, with areas assessed as demonstrating greatest potential marked by white stars (JMcD CHM 2006b: 9)

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Artefact Heritage (2014-2015)

In 2014 Artefact Heritage prepared an ASR for the entirety of the Bungarribee Precinct as part of Aboriginal heritage investigations for the Bungarribee Precinct Masterplan. As part of that investigation a number of previously recorded Aboriginal sites were revisited and several additional sites recorded.

The ASR discussed previously recorded Aboriginal sites within the Precinct, as well as additional sites identified during the preparation of that ASR. The outcome of the ASR was the refinement, of the boundaries of PAD WSP1 based on background research and sample archaeological survey (JMcD CHM 2006b). The refined extent of PAD WSP1, which was renamed “WS PAD1” for the purposes of that ASR, is shown in Figure 6.

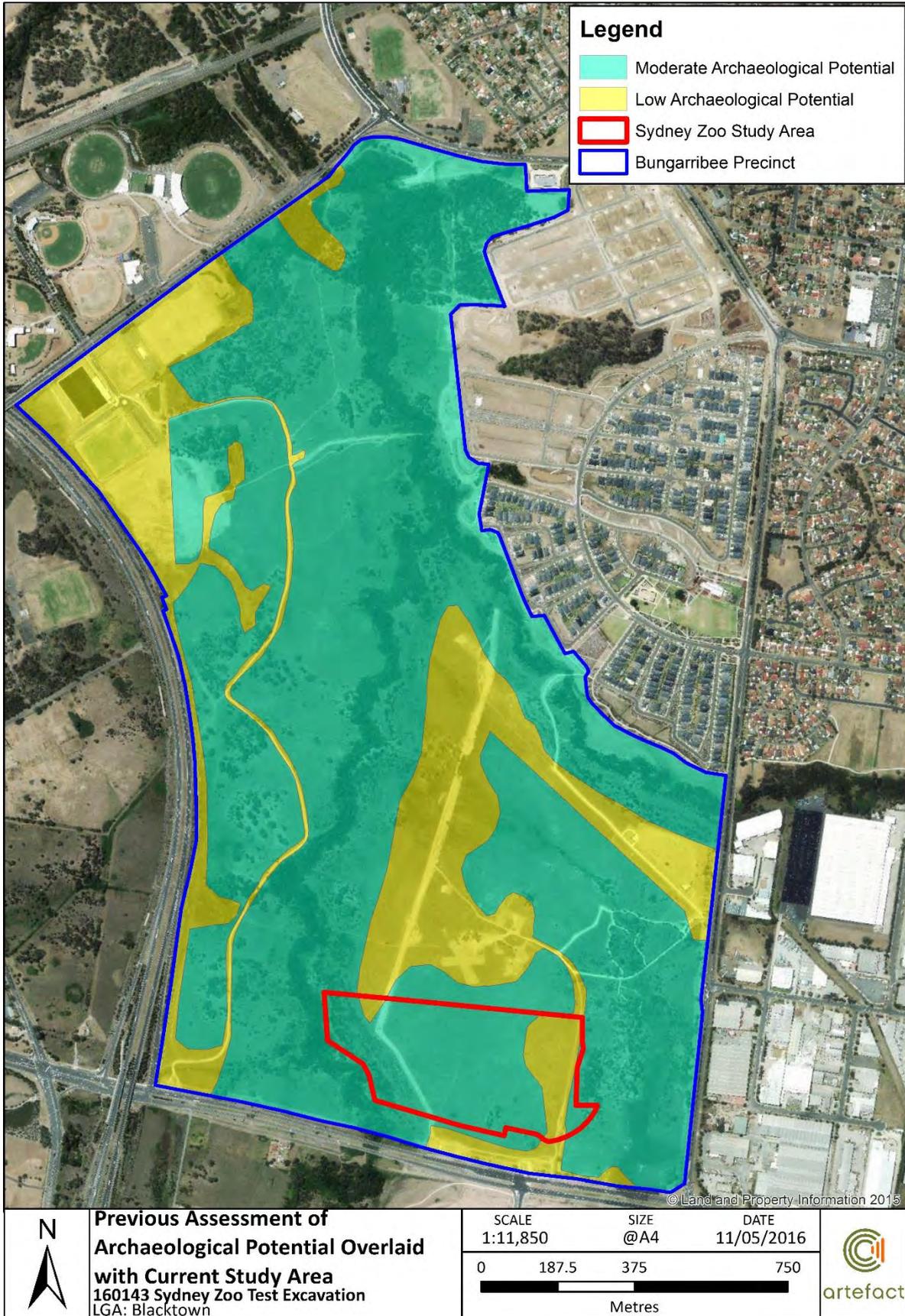
Artefact Heritage (2014) noted that no areas of high archaeological potential were identified within the Precinct. This was based on the results of subsurface investigation within the local area, including excavation at AHIMS site #45-5-2719 and #45-5-3255 within the Bungarribee Precinct, and at #45-5-3883 adjacent to the eastern margin of the Precinct (a further description of archaeological excavation at these three sites is included in Section 3.6.1).

The landform context of AHIMS site #45-5-3883, which included a slope context in close proximity to Bungarribee Creek and the confluence of that creek with Eastern Creek, demonstrated a very high-density artefact scatter. In contrast, excavation at AHIMS sites #45-5-3255 and #45-5-2719 further from Eastern Creek demonstrated much lower density artefact scatters. With localised exceptions the remainder of the Precinct was characterised by low-lying and gently undulating landform contexts bordering Eastern Creek and Bungarribee Creek.

Artefact Heritage (2015) identified the broad central portion of Bungarribee Precinct associated with Eastern Creek and Bungarribee Creek as demonstrating moderate archaeological potential (see Figure 6). It is likely that the density of potential subsurface archaeological deposit in this zone would vary, with large areas of low density archaeological deposit interspersed with areas of higher density deposits.

The majority of the current study area was assessed to have moderate archaeological potential during the Bungarribee Precinct Masterplan investigations.

Figure 6: Reassessment of archaeological potential within the Bungarribee Precinct, the current study area is outlined in red



3.6.1 Previous archaeological excavations within Bungarribee Precinct

Mills and Kelton (2002)

In 2002 Mills and Kelton undertook subsurface investigations at AHIMS site 45-5-2719 prior to the construction of the M7. A series of 328 augers, were opened up approximately 1 km northwest of the study area along the western boundary of the Eastern Creek floodplain, and including low-lying elevated land bordering the floodplain. Although the surface of the site included areas that appeared quite disturbed, test excavation retrieved a total of 83 artefacts from a relatively intact deposit.

JMcD CHM 2011 – Western Sydney Parklands: Bungarribee Precinct Project, Precinct 2 S87 Excavation Report

A portion of WSPAD1 within the Bunya residential area, 30 m north of Bungarribee Creek, was excavated as part of impact mitigation prior to development of that area (JMcD CHM 2011). The portion of excavated PAD is recorded on the AHIMS sites register with the site name WSP PAD AHIMS #45-5-3883. The site is located approximately 1.2 km north of SZ PAD02.

The excavations targeted the lower slope landform associated with the confluence of Eastern Creek and Bungarribee Creek. A dense assemblage of 5, 535 artefacts from 41 one metre square pits and 82 square metres of open area. The distribution of artefacts was found to be relatively even across the site with artefacts retrieved from all test units. The open area excavations targeted the higher flat ground of the testing area.

The excavations also retrieved a total of 1, 083 cultural pieces of silcrete and silicified tuff crenate affected by heat shatter, and 11,751 pieces of silcrete gravel. The high frequency of silcrete gravel was considered to indicate a minor silcrete raw material source at the site or nearby.

The majority of the lithic items recovered were silcrete followed by silicified tuff. A small proportion of quartz, silicified wood, quartzite and unidentifiable raw materials were also recovered. The assemblage contained cores, flakes, flake fragments and flaked pieces as well as retouched artefacts and backed artefacts. Reduction technologies such as bipolar knapping were observed within the assemblage.

The high proportion of silcrete within the assemblage as well as the high proportion of flake fragments and flaked pieces was considered to be related to the early stage knapping of locally available silcrete. The site was interpreted as representing multiple periods of occupation.

The site was considered to be of moderate to high archaeological significance.

Artefact Heritage 2014b – Bungarribee Wastewater Trunk Pipeline WSP Archaeological Salvage Excavation Report

In 2012, Artefact Heritage conducted a survey of a proposed wastewater trunk pipeline through the Bungarribee Precinct. Artefacts associated with three previously recorded Aboriginal sites (AHIMS #45-5-3253, #45-5-3255 and #45-5-3256) were identified within the assessment area. AHIMS #45-5-3255 and #45-5-3256 were assessed as demonstrating moderate archaeological significance with potential to provide information about Aboriginal occupation of the area. It was also determined that further investigation of these sites would enable comparisons to be made between past Aboriginal occupation within the Bungarribee Precinct and the local area. The salvage excavation covered the lower slope and terrace landform bordering the eastern side of the Eastern Creek floodplain.

AHIMS #45-5-3253 was assessed as demonstrating low archaeological significance due to the site being situated within a disturbed context. To mitigate impacts to Aboriginal cultural heritage by the

proposed works, surface collection of visible artefacts at AHIMS #45-5-3255 and #45-5-3256 was recommended. Salvage excavation was also recommended for AHIMS #45-5-3255.

Site #45-5-3255 was located on a low terrace landform. A total of 73 artefacts were retrieved from 35 salvage 1m by 1m units. The excavated artefact assemblage was primarily comprised of silcrete. Other raw materials present included mudstone, quartz, chert and fine grained siliceous. The assemblage was dominated by flakes and flake fragments with no formal tools identified.

The excavations identified a much lower density artefact scatter than that identified at site #45-5-3883 located on a lower hill slope associated with the confluence of Bungarribee and Eastern Creeks. This difference in densities indicates a trend in land-use patterns by Aboriginal people in the past. It appears that the lower hill slope landform of #45-5-3883 was occupied more intensely and over multiple time periods. Whilst the low terrace landform of #45-5-3255 was occupied less intensively and intermittently.

The surface collection conducted at AHIMS site #45-5-3253 did not recover any artefacts. There were 17 artefacts retrieved during the surface collection across site #45-5-3256. At the time that report was prepared, site boundary of AHIMS site 45-5-3256 was extended south to the Great Western Highway, including portions of the current study area. All artefacts identified on the ground surface associated with that extended site area were collected/ impacted under AHIP 1132317.

Further investigations within the Bungarribee Precinct and consideration of sub-surface artefact densities has led to a reappraisal of the site area of 45-5-3256, and refinement of its location to an area north of the current study area. Any surface artefacts associated with the former southern extent of 45-5-3256 that overlap with the Sydney Zoo site were impacted in accordance with AHIP 1132317.

Artefact Heritage 2015 – Bungarribee Precinct Masterplan Stages 1, 2 and 3. Archaeological Salvage excavation report

Following the archaeological survey and assessment of the Bungarribee Masterplan completed by Artefact Heritage in 2014, it was determined that 11 sites would be impacted as part of proposed works within the Precinct. Based on recommendations from Artefact Heritage, archaeological salvage was included within the Operational Conditions of the AHIP. A total of 55 1m by 1m excavation units were excavated within the study area in two locations named Bungarribee North and Bungarribee South.

The Bungarribee North salvage area was situated within the South Creek soil landscape within an undulating floodplain landform in close proximity to Eastern Creek. A total of 287 stone artefacts, weighing a maximum total of 148.35 grams, were recovered from 18 excavation units. The salvage excavations undertaken at Bungarribee North uncovered a moderate density stone artefact assemblage which exhibits some distinctive types of stone reduction activities. The stone artefact analysis demonstrated that knapping events were undertaken in this location, particularly within the area of the Stage II excavations (this is where the majority of the formal tools were identified). The formal tool types are associated with the Australian Small Tool Tradition and are typical of a Bondaian assemblage (likely dating anywhere from 8,000 BP up until the contact period). Preference of raw material use for the production of formal tools is indicated as all of the tools were composed of mudstone. No silcrete tools were identified.

The Bungarribee South salvage area was situated within the Blacktown soil landscape on raised terrain associated with a first order watercourse flowing into the Bungarribee and Eastern Creek floodplains. A total of 37 units were excavated within this area. A total of 346 stone artefacts, weighing a maximum total of 935.76 grams, were recovered from the Bungarribee South area as a result of the salvage excavations.

The salvage excavations undertaken at Bungarribee South uncovered a low density stone artefact assemblage of small to medium size flakes, angular fragments and cores. One artefact was identified as having some scalar retouch with evidence of usewear and defined as a utilised flake. The raw materials utilised at the site are common in the region. No evidence of intensive occupation of the site or the manufacture of stone tools was identified. The assemblage was interpreted as opportunistic general stone reduction and discard rather than intensive occupation or site use reflective of transient campsites related to the movement of Aboriginal people across the landscape.

The salvage excavations revealed that the landform contexts are associated with two different types of archaeological sites which exhibit different types of stone artefact reduction techniques or behaviours.

3.6.2 Archaeological Implications for the Study Area

Previous excavations within the Bungarribee Precinct have revealed the potential for high density artefact scatters to occur in association with Eastern Creek and Bungarribee Creek floodplain. Excavations have indicated that the intensity of occupation as evidenced by the density and complexity of the artefact assemblage varies according to landform. There is potential for artefacts to occur throughout the Bungarribee Precinct in varying densities according to landform and disturbance levels.

3.7 Predictive Model

Archaeological data gathered in the locality has demonstrated the widespread and varying use of the area by Aboriginal people. This predictive model comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected in the study area. These statements are based on the information gathered regarding:

- Landscape context and landform units.
- Ethno-historical evidence of Aboriginal land use.
- Distribution of natural resources.
- Results of previous archaeological work in the area.
- Predictive modelling proposed in previous archaeological investigations.

Predictive statements are as follows:

- Stone artefact scatters are the most likely Aboriginal site type to be identified within the study area. This has been demonstrated in previous archaeological investigations which have identified a series of sites across the Precinct.
- There is potential for intact subsurface archaeological deposits with high densities of stone artefacts. This has been demonstrated through the archaeological excavation of WSP PAD1, north of Bungarribee Creek (JMcD CHM 2011).
- Based on the location of recorded Aboriginal sites within the Precinct and on predictive models developed for the Cumberland Plain (White and McDonald 2010) the highest numbers of sites and sites with the highest densities of artefacts are likely to be located along Eastern Creek.
- In situ stone artefacts are likely to be located where there is least ground disturbance.
- Based on the natural resources available and the results of previous archaeological investigations, silcrete will be the dominant raw material of stone artefact assemblages.

- Where old growth native vegetation remains there is potential for scarred trees to be located. As there are few areas of remnant native vegetation there are few areas where this site type is likely to occur.
- Visibility is likely to be low, obstructed by dense grass cover. Sites on the ground surface will be most obvious in exposed areas where vegetation has recently been cleared and/or on tracks.

3.8 Results of Site Survey

The site survey was conducted in accordance with the Code of Practice. It was attended by a representative of DLALC and two archaeologists from Artefact Heritage. The survey targeted areas of high surface visibility and inspected the recorded locations of all AHIMS sites within the study area. Visibility was generally nil across the study area and limited to exposures associated with access tracks.

The site survey did not relocate artefacts originally identified at the recorded AHIMS site locations within the study area. This is likely due to the dense vegetation cover as the areas in which the sites were located appeared to be generally intact with low disturbance and there are no permits associated with the AHIMS entries. It is also likely due to the fact that the site cards for 45-5-0455 and 45-5-0465 indicate that artefacts were collected from those locations at the time of the original recording.

Two areas of archaeological potential were identified during the survey. The PADs, SZ PAD01 and SZ PAD02 were observed to have been minimally disturbed. SZ PAD01 is located on a raised terrace adjacent to Eastern Creek. Previous archaeological excavations within the Bungarribee Precinct have identified high artefact densities and intact deposits within this landform (Artefact Heritage 2015). SZ PAD02 is located on an intact crest landform overlooking Eastern Creek. This landform had not been excavated within the Bungarribee Precinct previously and was considered to have unknown significance.

The ASR is attached as Appendix D to this ACHAR.

3.9 Results of Test Excavation at SZ PAD02

Test excavations were carried out at SZ PAD02 between 26 April and 29 April 2016 with the aim of informing this ACHAR. The test excavations focussed on SZ PAD02 and were conducted in order to determine the presence and nature of subsurface archaeological deposits.

The test excavations identified two new Aboriginal sites, SZ AS01 and SZ AS02. Site SZ AS01 consists of 26 stone artefacts and site AZ AS02 consists of three stone artefacts (Figure 2). The sites are characterised as dispersed low density artefact scatters. Both sites are considered to demonstrate low rarity and research potential and have been assessed as having low archaeological significance.

The archaeological test excavation report is included as Appendix E to this ACHAR.

3.10 Summary of Aboriginal Archaeological Sites

An overview of the sites located within the study area is presented in Figure 2. The following description of AHIMS sites #45-5-0455, #45-5-0465 and #45-5-4433 are taken from the site cards lodged with AHIMS.

Bungarribee 10 Blacktown #45-5-0455

Bungarribee 10 is an artefact scatter located about 200 m along a road leading from the former OTC transmission station entrance to the station itself. In 1984 Kohen recorded and collected a chert point, a chert flake and a silcrete flake.

Bungarribee 18 Blacktown #45-5-0465

Bungarribee 18 is an artefact scatter located in an artificial drainage ditch midway between Eastern Creek and the road leading into the Precinct from the OTC transmission station entrance. Kohen recorded and collected three silcrete artefacts and a utilised slab of local igneous rock adjacent to the artificial drainage ditch, and noted that the site was located in a highly disturbed context.

BP-AS-6 #45-5-4433

BP-AS-6 is an artefact scatter located on the mid slope in an area of rolling hills/ grasslands. Artefact Heritage recorded the site as part of efforts to relocate AHIMS # 45-5-3526 which had previously been recorded with inaccurate coordinates. The site consists of two silcrete artefacts associated with numerous natural silcrete gravels.

Sydney Zoo Artefact Scatter 01 (SZ AS01) #Pending

Sydney Zoo Artefact Scatter 01 was identified following test excavation at SZ PAD02. The site consists of 26 stone artefacts recovered from an area measuring approximately 60m by 33m. The site is located on the crest break of slope and forms a gentle slope gradient towards Eastern Creek.

The assemblage recovered consists of predominantly silcrete artefacts (n= 23, 88%) with fine grained siliceous (n=2, 8%) and quartz (n=1, 4%) also present. Reduction types recorded include complete flakes, flake fragments, angular fragments and a core.

Sydney Zoo Artefact Scatter 02 (SZ AS02) #Pending

Sydney Zoo Artefact Scatter 02 was identified following test excavation at SZ PAD02. The site consists of 5 stone artefacts recovered from an area measuring approximately 33m by 13m. The site is located on a crest landform overlooking Eastern Creek.

The assemblage recovered consists of silcrete (n=4, 80%) and quartz (n=1, 20%). Reduction types recorded include complete flakes, broken flakes and angular fragments.

4.0 SIGNIFICANCE ASSESSMENT

4.1 Aboriginal Material Culture

There are five Aboriginal archaeological sites and one PAD located within the study area. These are:

- Bungarribee 10 Blacktown #45-5-0455
- Bungarribee 18 Blacktown #45-5-0465
- BP-AS-6 #45-5-4433
- SZ AS01 #45-5-4772
- SZ AS02 #45-5-4771
- SZ PAD01

Sites #45-5-0455, #45-5-0465, and #45-5-4433 consist of artefact scatters. The artefacts at these sites were not relocated during the investigation undertaken for the ACHAR. This is likely due to the dense grass cover at the time of the site visit rather than removal or destruction of the sites themselves. Sites SZ AS01 (#45-5-4772) and SZ AS02 (#45-5-4771) were identified following the test excavations undertaken for this assessment. PAD SZ PAD01 was not tested due to its location within a landform that has been previously identified as having moderate archaeological potential. Previous excavations have provided sufficient information on that landform context for an assessment of the likely level of scientific significance (see Table 7 below).

4.2 Significance Assessment

An assessment of the cultural heritage significance of an item or place is required in order to form the basis of its management. The Office of Environment and Heritage (2011) provides guidelines for heritage assessment with reference to the Burra Charter (Australia ICOMOS 2013) and the Heritage Office guidelines (2001). The assessment is made in relation to four values or criteria (Table 6). In relation to each of the criteria, the significance of the subject area should be ranked as high, moderate or low.

In addition to the four criteria, OEH requires consideration of the following:

- Research potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity: is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential: does the subject area contain teaching sites or sites that might have teaching potential?

It is important to note that heritage significance is a dynamic value.

Table 6: Heritage criteria.

Criterion	Description
Social	The spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them. Does the subject area have strong or special association with the Aboriginal community for social, cultural or spiritual reasons?
Historic	Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Is the subject area important to the cultural or natural history of the local area and/or region and/or state?
Scientific	This refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information. Information about scientific values will be gathered through any archaeological investigation undertaken. Does the subject area have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state?
Aesthetic	This refers to the sensory, scenic, architectural and creative aspects of the place. It is often linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use. Is the subject area important in demonstrating aesthetic characteristics in the local area and/or region and/or state?

4.2.1 Social Significance

OEH specifies that the social or cultural value of a place must be identified through consultation with Aboriginal people. The consultation process for the present project has not yet been completed, however the initial stages, along with the results of previous projects, have provided an indication of the social value of the study area.

No specific areas of cultural importance within the study area were identified by representatives of the registered Aboriginal stakeholders during the field survey or test excavation program. However, it was made clear that the surrounding country and landscape as a whole is culturally significant to Aboriginal people.

4.2.2 Historic Significance

The study area is not known to be associated with any people, events or activities of historical importance to the Aboriginal community.

4.2.3 Scientific Significance

A summary of the archaeological significance values of the Aboriginal sites and PAD located within the study area is given in Table 7.

Table 7: Summary of scientific significance.

AHIMS#/Site Name	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
45-5-0455/Bungarribee 10 Blacktown	Low	Low	Low	Low	Low
45-5-0465/Bungarribee 18 Blacktown	Low	Low	Low	Low	Low
45-5-4433/ BP-AS-6	Low	Low	Low	Low	Low
45-5-4772 /SZ AS01	Low	Low	Low	Low	Low
45-5-4771 /SZ AS02	Low	Low	Low	Low	Low
SZ PAD01	Moderate	Moderate	Moderate*	Moderate*	Moderate*

*= likely level of significance based on salvage at Bungarribee North and South

Sites of low archaeological significance

Sites #45-5-0455, #45-5-0465, #45-5-4433, #45-5-4771 and #45-5-4772 have been assessed as demonstrating low archaeological significance. Archaeological investigations within the Bungarribee Precinct indicate that dispersed artefact scatters and isolated artefacts are common within the local context. Additionally, site cards for 45-5-0455 and 45-5-0465 indicate the removal of identified artefacts at the time of the original site recording. These sites do not contain research potential or archaeological value.

Sites of moderate archaeological significance

Previous archaeological investigations within the Bungarribee Precinct have identified the high potential for Aboriginal artefacts to occur in subsurface deposits associated with Eastern Creek. Results of an archaeological excavation on the Eastern Creek floodplain at Bungarribee North by Artefact Heritage (2015) retrieved a moderate density subsurface stone artefact scatter across a disturbed floodplain landform. The results of that excavation and identification of SZ PAD01 as an extension of that area of archaeological potential suggests that the assessed level of moderate research potential at Bungarribee North is likely to also be relevant to SZ PAD01.

The assessment of SZ PAD01 as having moderate archaeological significance is based on the following results from the Bungarribee North salvage excavation and artefact analysis:

- A clear correlation between formal tools and mudstone indicating a preference for high quality fine grained materials in tool production
- The identification of tool types within the assemblage that are indicative of a Bondaian tool technology which could date the assemblage up to 8,000 yBP
- The identification of at least one discrete knapping event at
- The rarity of the site and artefact assemblage characteristics within the Bungarribee Precinct.

Based on the results of salvage excavation, Bungarribee North was assessed as demonstrating moderate archaeological significance. The archaeological salvage has confirmed the research potential of the Eastern Creek floodplain and surrounding slope landform contexts. The location of SZ PAD01 within a similar landform indicates that it likely to also contain archaeological deposits considered to be of moderate archaeological significance.

4.2.4 Aesthetic Significance

The study area has been subject to modification over the historical period through to the present. In particular, the location of the identified Aboriginal objects has been subject to disturbance due to the close presence of the current Sport and Recreation Centre. Each of the objects has some aesthetic value, related to an appreciation of its material, manufacture and use.

The study area is considered to be of low aesthetic significance in terms of Aboriginal heritage.

4.3 Statement of Significance

The study area contains Aboriginal sites which are considered to have low scientific values. The study area contains an archaeologically sensitive landform considered to have moderate scientific values. These Aboriginal sites and landform are considered to be of social significance to the contemporary Aboriginal community as part of an increasingly rare archaeological resource providing a tangible connection to the pre-contact Aboriginal people of the area.

The remainder of the study area is considered to have no scientific value.

5.0 AVOIDING AND MINIMISING HARM

5.1 Summary of Impacts

The largest impact to the study area would be the initial bulk earthworks, which will involve cutting and levelling of the natural terrain.

Subsequent civil and building works are considered to be ancillary impacts. The bulk earthworks would directly impact on #45-5-0455, #45-5-0565, #45-5-4433, #45-5-4771 and #45-5-4772 (Figure 7).

The current design received by Artefact Heritage indicates that PAD SZ PAD01 would only be partially impacted by the proposal. These impacts are limited to a small portion of the eastern boundary of the PAD encroaching a maximum 8m into the PAD area. Discussions with the civil engineering team for the proposal indicate that the impacts in this area would be limited to the introduction of fill associated with the construction of an access road and batter slopes (John Fraser pers. comm. 2016). The total impact area would measure 1,401m² this accounts for 5% of the total PAD area.

The assessment of impact is summarised in Table 8.

Table 8: Impact assessment

AHIMS#	Name	Type of Harm	Degree of Harm	Consequence of Harm
45-5-0455	Bungarribee 10 Blacktown	Direct	Total	Total loss of value
45-5-0565	Bungarribee 18 Blacktown	Direct	Total	Total loss of value
45-5-4433	BP-AS-6	Direct	Total	Total loss of value
45-5-4772	SZ AS01	Direct	Total	Total loss of value
45-5-4771	SZ AS02	Direct	Total	Total loss of value
N/A	SZ PAD01	Direct	Partial	Partial loss of value

5.2 Consideration of Alternatives and Justification of Impacts

The ASR and ATER identified five Aboriginal sites and one area of archaeological potential within the study area. The sites have all been assessed to be of low archaeological significance. The PAD has been assessed to be of moderate archaeological significance.

During the initial reporting for this assessment the proposal included larger and more significant impacts to SZ PAD01. The most recent designs received by Artefact Heritage indicate that these impacts are likely to be much more minor in nature along a small portion of the margin of the PAD. Therefore, the proposal would not impact any sites of high or unknown archaeological and cultural significance and would have only minor impacts on an area of moderate archaeological significance.

Figure 7: Proposed impacts to Aboriginal sites

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5.3 Ecologically Sustainable Development (ESD) Principles

In accordance with the Guide, Ecologically Sustainable Development (ESD) principles have been considered in the preparation of this ACHAR, including options to avoid impacts to Aboriginal cultural heritage, assessment of unavoidable impacts, identification of mitigation and management measures, and taking into account Aboriginal community views.

The principles of ESD are detailed in the NSW *Protection of the Environment Administration Act 1991*. The ESD principles relevant to the assessment of the current proposal as it relates to Aboriginal cultural heritage are considered below.

5.3.1 The integration principle

Decision-making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations (the 'integration principle'). The proposal would comply with the integration principle in regard to Aboriginal heritage. There are no areas of high significance located within the study area that will be impacted.

5.3.2 The precautionary principle

If there are threats of serious or irreversible environmental damage, lack of full scientific confidence should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle').

The five recorded Aboriginal sites located within the study area would be impacted by the proposal.

Scientific confidence has been achieved for all Aboriginal sites located within the study area through assessment of prior research, observations made during the site survey and in the case of SZ AS01 and SZ AS02 through archaeological excavations.

The recorded PAD (SZ PAD01) would only be impacted to a minor degree along the eastern margin. There is no considerable scientific uncertainty as to the impacts of the project on the heritage values of this PAD. Predictive models have been used to assess the probable nature of the archaeological record within the study area, based on other studies in the locality. Whilst it is likely that Aboriginal objects may be located within the PAD area the proposed introduction of fill to the area would only impact a very small portion of the overall PAD.

5.3.3 The principle of intergenerational equity

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'principle of intergenerational equity'). Sites #45-5-0455, #45-5-0465, #45-5-4433, SZ AS01 and SZ AS02 have been assessed as demonstrating low archaeological significance.

No sites of high or unknown archaeological significance would be impacted by the proposal. Management and mitigation measures for sites which are to be impacted by the proposal are detailed in section 5.4. Reburial of Aboriginal objects retrieved from SZ AS01 and SZ AS02 near the study area would enable some retention of the significance of those sites.

5.3.4 Conservation of biodiversity

Cultural values of biodiversity are intertwined with the lives of Aboriginal people and their use of the landscape. Biological impacts of the project are considered in separate technical report.

5.4 Management and Mitigation Measures

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved.

Where unavoidable impacts occur then measures to mitigate and manage impacts are proposed. Mitigation measures primarily concern preserving the heritage values of sites beyond the physical existence of the site. The most common methods of this involve detailed recording of Aboriginal objects, archaeological test and salvage excavations, artefact analysis and, where appropriate, reburial of Aboriginal objects in a location determined by the registered Aboriginal stakeholders.

Mitigation measures vary depending on the assessment of archaeological significance of a particular Aboriginal site and are based on its research potential, rarity, representativeness and educational value. In general, the significance of a site would influence the choice of preferred conservation outcomes and appropriate mitigation measures, usually on the following basis:

- **Low archaeological significance-** Conservation where possible, but usually no mitigation required if impacts are unavoidable.
- **Moderate archaeological significance-** Conservation where possible. If conservation is not practicable, salvage excavations or similar mechanisms determined in consultation with the Aboriginal community may be necessary.
- **High archaeological significance-** conservation as a priority. Only if all practicable alternatives have been exhausted would impacts be considered justified. Comprehensive salvage excavations may be necessary.

The proposal is likely to have unavoidable impacts on all of the Aboriginal sites located within the study area. These sites have all be assessed as demonstrating low archaeological significance. The proposal would have minor impacts on a small portion of PAD SZ PAD01. The remainder of SZ PAD01 located outside of the proposal area would not be impacted.

The archaeological significance of the Aboriginal sites and PAD within the study area has been adequately assessed by taking into account the archaeological potential associated with landscape, landform units, ground disturbance levels, results of previous excavations, studies in the Precinct and assessment of significance values including rarity and representativeness.

Salvage excavation of SZ PAD01 is not necessarily warranted in this case as salvage excavation is intended to collect sufficient information to mitigate against impacts. The impacts to this PAD are considered to be of such a minor nature that salvage is not required to mitigate these impacts.

Given these findings, consideration of ESD principles, the views of the registered Aboriginal stakeholders, and the lack of practicable alternatives to avoid impacts, the recommended mitigation and management measures are presented in Table 9.

Table 9: Summary of impacts and mitigation and management recommendations for all sites

AHIMS	Site name	Significance	Type of harm	Degree of harm	Mitigation/management
45-5-0455	Bungarribee 10 Blacktown	Low	Direct	Total	<p>None (all data available from the site has been retrieved)</p> <p>Submit site impact recording form to AHIMS following impact</p>
45-5-0465	Bungarribee 18 Blacktown	Low	Direct	Total	<p>None (all data available from the site has been retrieved)</p> <p>Submit site impact recording form to AHIMS following impact</p>
45-5-4433	BP-AS-6	Low	Direct	Total	<p>None (all data available from the site has been retrieved)</p> <p>Submit site impact recording form to AHIMS following impact</p>
45-5-4772	SZ AS01	Low	Direct	Total	<p>None (all data available from the site has been retrieved)</p> <p>Submit site impact recording form to AHIMS following impact</p>
45-5-4771	SZ AS02	Low	Direct	Total	<p>None (all data available from the site has been retrieved)</p> <p>Submit site impact recording form to AHIMS following impact</p>
N/A	SZ PAD01	Moderate	Direct	Partial	<p>Include location in CEMP to ensure no inadvertent impacts beyond those shown in Figure 7 during construction works.</p> <p>If the concept design changes and the site is to be impacted further archaeological investigation would be required.</p>

5.5 Proposed Management Policy for Aboriginal Heritage

5.5.1 Sydney Zoo PAD01

As has been discussed above the current design for the proposal indicates that an area measuring 1,401m² of SZ PAD01 would be impacted. These impacts would be limited to the introduction of fill. It is understood that there would be no subsurface impacts within this area. The nature and size of the proposed impacts are not considered to warrant salvage excavation of SZ PAD01.

It is considered unlikely that a salvage excavation of such a small area of the PAD would retrieve information that would contribute to research questions for the Bungarribee Precinct or the wider Cumberland Plain. This assumption is also based on the vast amount of information available from previous archaeological studies within the Bungarribee Precinct.

Therefore, it is recommended that the location of the PAD is included in the Construction Environment Management Plan [CEMP] (see section below). An exclusion zone should be established around the perimeter of the PAD to prevent inadvertent impacts during construction. It should be noted that even minor works such as the construction of fences, access tracks and site sheds are not permitted within the PAD boundaries.

If the proposal should change and larger impacts are proposed within the PAD area, these design changes should be assessed by an archaeologist and may warrant further investigation. If works such as revegetation are proposed within the PAD area this would require further investigation and possible salvage.

5.5.1 Construction Environment Management Plan (CEMP) and unexpected finds procedure

A CEMP and accompanying unexpected finds procedure will provide a method to manage potential heritage constraints and unexpected finds during construction works. Aspects of site area protection that should be included in the CEMP include:

- Establishing no-harm areas where appropriate. Depending on the nature and timing of works in the vicinity of identified Aboriginal sites that will not be impacted by the proposal, it may be appropriate to establish visual markers around no-harm areas to avoid inadvertent impacts.
- Nature of the visual markers around no-harm areas. The CEMP should document what type of visual marker will be put in place, such as temporary fencing, high visibility tape, and temporary signage.
- Provide clear guidance to all site workers on access restrictions to no-harm areas.
- Unexpected finds procedure if Aboriginal objects are identified during construction work should stop immediately and DLALC, OEH and an archaeologist contacted to identify and record the objects.

5.5.2 Discovery of human remains

If suspected human remains are located during any stage of the proposal, work should stop immediately and the NSW Police and the Coroner's Office should be notified. The Office of Environment and Heritage, Aboriginal stakeholder groups and an archaeologist should be contacted if the remains are found to be Aboriginal.

5.5.3 Changes to the proposal

This ACHAR is based upon the most recent information made available to Artefact Heritage as of the date of preparation of this report. Any changes made to the proposal should be assessed by an archaeologist in consultation with the registered Aboriginal stakeholder groups. Any changes that may impact on Aboriginal sites not assessed during the current study may warrant further investigation and result in changes to the recommended management and mitigation measures. Any changes that result in further impacts to SZ PAD01 may require salvage excavation to mitigate those impacts.

5.5.4 Ongoing consultation with Aboriginal stakeholder groups

Consultation with registered Aboriginal stakeholders would continue throughout the life of the project, as necessary. Ongoing consultation with registered Aboriginal stakeholders will take place throughout preparation and display of the EIS, any salvage excavations, reburial of retrieved artefacts and in the event of any unexpected Aboriginal objects being identified during works.

5.5.5 Management of Aboriginal objects

Reburial of excavated and collected artefact assemblages is currently commonly preferred by Aboriginal community groups and individuals working in cultural heritage management on the Cumberland Plain. During consultation stakeholders supported the reburial of artefacts within the Bungaribee Precinct. An appropriate reburial location would be chosen based on consultation with registered Aboriginal stakeholders, Sydney Zoo and the WSPT.

6.0 RECOMMENDATIONS

The following recommendations are based on consideration of:

- Legislative, policy and procedural requirements for the assessment of Aboriginal cultural heritage
- The recommendations of the ASR
- The findings of the test excavation
- ESD principles
- The views and information provided by registered Aboriginal stakeholder groups
- The likely impacts of the proposed development.

It was found that:

- A total of five Aboriginal sites were identified during the ASR and test excavation investigations.
- One area of PAD (SZ PAD01) was identified adjacent to the Eastern Creek corridor
- The proposal would impact the five Aboriginal sites (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771). These sites have been assessed as demonstrating low archaeological significance
- The proposal would impact very small portions of SZ PAD01. These impacts would be limited to the introduction of fill along the eastern margin of the PAD area

It is recommended that:

- No further archaeological investigation is required at the five sites that have been assessed as demonstrating low archaeological significance (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771).
- Based on the most recent designs received by Artefact Heritage no further works are required within SZ PAD01. If the designs are to change and result in additional impacts to this area further archaeological investigation and possible salvage may be required.
- An appropriate reburial location for artefacts recovered during test excavation would be chosen based on consultation with registered Aboriginal stakeholders, Sydney Zoo and the WSPT. A site update card should be forwarded to the OEH AHIMS Registrar with information on the location and depth of reburial.
- Site impact recording forms would be submitted to AHIMS for all five sites that would be impacted by the proposal (#45-5-0455, #45-5-0465, #45-5-4433, #45-5-4772 and #45-5-4771).
- Inadvertent impacts to those portions of SZ PAD01 outside the impact area, should be avoided by including information on its location in the CEMP. Where necessary fencing may be used to create an exclusion zone.
- A CEMP and accompanying unexpected finds procedure would provide a method to manage potential heritage constraints and unexpected finds during construction works. Aspects of site area protection that should be included in the CEMP include:
 - Establishing no-harm areas where appropriate.

- Nature of the visual markers around no-harm areas. The CEMP should document what type of visual marker would be put in place, such as temporary fencing, high visibility tape, and temporary signage
- Provide clear guidance to all site workers on access restrictions to no-harm areas.
- Unexpected finds procedure, including procedures for human remains.
- Should any changes be made to the proposal boundary, these should be assessed by an archaeologist in consultation with the registered Aboriginal stakeholder groups and further investigation may be necessary
- This ACHAR and accompanying documentation should be forward to registered Aboriginal stakeholders, DPE and OEH.

7.0 REFERENCES

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8.0 APPENDICES

Appendix A: Consultation Log

This appendix has been removed from the public version of this document

Appendix B: Newspaper Notice

Aboriginal Heritage Due Diligence Assessment - Invitation to Register Interest

Artefact Heritage, on behalf of Sydney Zoo, is seeking Expressions of Interest from relevant Aboriginal groups or individuals. Sydney Zoo propose to establish a zoo within the southern section of the Bungarribee Precinct of the Western Sydney Parklands, Blacktown. The proposal will be assessed as a State Significant Development (SSD). The purpose of the community consultation is to assist the Director-General of the Department of Planning and Environment in the determination of the State Significant development under the Environmental Planning and Assessment Act 1979. The proponent therefore seeks to consult with all Aboriginal persons and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal places in the Bungarribee area.

Interested parties should register in writing, providing their name, address, phone number and information on their connection to the area. Submissions should be registered with Sydney Zoo c/o Claire Rayner, Archaeologist, Artefact Heritage, Level 4 Building B, 35 Saunders Street Pymont NSW 2009, by 14 July 2015, providing the information requested above.

Appendix C: Consultation Documentation

Agency Letters



National
Native Title
Tribunal

2 July 2015

Sydney Office, Operations East

Level 16, Law Courts Building
Queens Square
Sydney NSW 2000
GPO Box 9973
Sydney NSW 2001
Telephone (02) 9227 4000
Facsimile (02) 9227 4030

Our Ref: 0754 -15SJ

Your Ref: Bungaribee

Native Title Search Results for Blacktown City Council Local Government Area

Thank you for your search request received on 29 June 2015 in relation to the above area.

Search Results

The results provided are based on the information you supplied and are derived from a search of the following Tribunal databases:

Register Type	NNTT Reference Numbers
Schedule of Applications (unregistered claimant applications)	Nil.
Register of Native Title Claims	Nil.
National Native Title Register	Nil.
Register of Indigenous Land Use Agreements	Nil.
Notified Indigenous Land Use Agreements	Nil.

At the time this search was carried out, there were **no relevant entries** in the above databases.

Please note: There may be a delay between a native title determination application being lodged in the Federal Court and its transfer to the Tribunal. As a result, some native title determination applications recently filed with the Federal Court may not appear on the Tribunal's databases.

Tribunal accepts no liability for reliance placed on enclosed information



The enclosed information has been provided in good faith. Use of this information is at your sole risk. The National Native Title Tribunal makes no representation, either express or implied, as to the accuracy or suitability of the information enclosed for any particular purpose and accepts no liability for use of the information or reliance placed on it.

If you have any further queries, please do not hesitate to contact me on the numbers listed below.

Yours sincerely



Searching the NNTT Registers in New South Wales

Search service

On request the National Native Title Tribunal may search its public registers for you. A search may assist you in finding out whether any native title applications (claims), determinations or agreements exist over a particular area of land or water.

In New South Wales native title cannot exist on privately owned land including family homes or farms.

What information can a search provide?

A search can confirm whether any applications, agreements or determinations are registered in a local government area. Relevant information, including register extracts and application summaries, will be provided.

Most native title applications do not identify each parcel of land claimed. They have an external boundary and then identify the areas not claimed within the boundary by reference to types of land tenure e.g., freehold, agricultural leasehold, public works.

What if the search shows no current applications?

If there is no application covering the local government area this only indicates that at the time of the search either the Federal Court had not received any claims in relation to the local government area or the Tribunal had not yet been notified of any new native title claims.

It does not mean that native title does not exist in the area.

Native title may exist over an area of land or waters whether or not a claim for native title has been made.

Where the information is found

The information you are seeking is held in three registers and on an applications database.

National Native Title Register

The National Native Title Register contains determinations of native title by the High Court, Federal Court and other courts.

Register of Native Title Claims

The Register of Native Title Claims contains applications for native title that have passed a registration test.

Registered claims attract rights, including the right to negotiate about some types of proposed developments.

Register of Indigenous Land Use Agreements

The Register of Indigenous Land Use Agreements contains agreements made with people who hold or assert native title in an area.

The register identifies development activities that have been agreed by the parties.

Schedule of Native Title Claims

The Schedule of Native Title Claims contains a description of the location, content and status of a native title claim.

This information may be different to the information on the Register of Native Title Claims, e.g., because an amendment has not yet been tested.

How do I request a native title search?

Download the Search Request Form from the Tribunal's website at -

<http://www.nntt.gov.au/assistance/Pages/Searches-and-providing-Register-information.aspx>

Email to: NSWEnquiries@nntt.gov.au

Post to: GPO Box 9973 Sydney NSW 2001

For additional enquiries: 02 9227 4000



1 July 2015 ref: OE&H : 1-7-2015/4

Dear Sir or Madam

Aboriginal Cultural Heritage Assessment

Sydney Zoo Proposal

I refer to your letter of 29 June 2015 regarding the above matter.

We acknowledge that section 4.1.2 of the Office of Environment & Heritage's *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* require you to contact us in order to compile a list of Aboriginal people who may have an interest in the proposed project area and hold knowledge relevant to determining the cultural significance of Aboriginal objects and/or places.

However, we advise that NTSCORP's privacy guidelines restrict us from providing proponents with contact details of traditional owners who may have such an interest or hold such knowledge.

Please be advised that, in response to your notification, we will forward your correspondence to any individuals, groups and organisations whom NTSCORP is aware assert traditional interests within or hold cultural knowledge about the relevant area. Recipients of our correspondence will be invited to register their interest in the project directly with you by 14 July 2015.

Please be aware that NTSCORP cannot make a guarantee or undertaking that the recipients of our correspondence represent the entirety of traditional owners for the relevant area.

Yours faithfully,



OFFICE OF THE REGISTRAR
ABORIGINAL LAND RIGHTS ACT 1983 (NSW)

11-13 Mansfield Street
Glebe NSW 2037
PO Box 112, Glebe NSW 2037
P. 02 9562 6327 F. 02 9562 6350

1 July 2015

Re: Request - Search for Registered Aboriginal Owners

I refer to your letter dated 29 June 2015 regarding Aboriginal Stakeholders within the area of Bungaribee NSW.

I have searched the Register of Aboriginal Owners and the project area described *does not appear* to have Registered Aboriginal Owners pursuant to Division 3 of the *Aboriginal Land Rights Act 1983 (NSW)*.

I suggest that you contact the Deerubbin Local Aboriginal Land Council. They will be able to assist you in identifying other Aboriginal stakeholders for this project.

Yours sincerely



Office of
Environment
& Heritage

Our reference: SF15/1617

Dear (redacted),

Thank you for your letter dated 29/06/2015 to the Office of Environment and Heritage (OEH) regarding obtaining a list of the Aboriginal stakeholders that may have an interest in the proposed State Significant development within the southern section of the Bungarribee Precinct of the Western Sydney Parklands, Bungarribee (Blacktown LGA).

Please find attached the list of Aboriginal stakeholders known to OEH that may have an interest in the project.

As the Department of Planning and Environment is the approval authority for this project, the consultation process should be in accordance with the relevant guidelines as stipulated by the Department of Planning and Environment.

If you wish to discuss any of the above matters further please contact (redacted).

Please note that the OEH postal address for requests for relevant Aboriginal stakeholder information changed nearly two years ago. We can no longer guarantee that letters sent to the old mailbox will be received by us. Please make the necessary changes to your database to reflect the current mailing address below.

Yours sincerely

**LIST OF ABORIGINAL STAKEHOLDERS FOR THE WESTERN SYDNEY LGA'S HELD BY OEH FOR THE PURPOSES OF THE
*ABORIGINAL CULTURAL HERITAGE CONSULTATION REQUIREMENTS FOR PROPONENTS 2010***

These lists are provided to proponents in accordance with section 4.1.2 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (the "Consultation Requirements") which commenced on 12 April 2010.

The consultation process involves getting the views of, and information from, Aboriginal people and reporting on these. It is not to be confused with other field assessment processes involved in preparing a proposal and an application. Consultation does not include the employment of Aboriginal people to assist in field assessment and/or site monitoring. Aboriginal people may provide services to proponents through a contractual arrangement however, this is separate from consultation. The proponent is not obliged to employ those Aboriginal people registered for consultation. Consultation as per these requirements will continue irrespective of potential or actual employment opportunities for Aboriginal people.

A copy of the Consultation Requirements can be found on the OEH website at:
<http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf>.

Under the Consultation Requirements; a proponent is required to provide Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places as relevant to the proposed project area, with an opportunity to be involved in consultation. Section 3.3.1 of the Consultation Requirements states that Aboriginal people who can provide this information are, based on Aboriginal lore and custom, the traditional owners or custodians of the land that is the subject of the proposed project.

The Consultation Requirements also state that:

Traditional owners or custodians with appropriate cultural heritage knowledge to inform decision making who seek to register their interest as an Aboriginal party are those people who:

- *continue to maintain a deep respect for their ancestral belief system, traditional lore and custom*
- *recognise their responsibilities and obligations to protect and conserve their culture and heritage and care for their traditional lands or Country*
- *have the trust of their community, knowledge and understanding of their culture, and permission to speak about it.*

Please note: the placement of an organisation's name on any OEH Aboriginal stakeholder list for the Consultation Requirements does not override a proponent's requirement to also advertise in the local newspaper and to seek from other sources the names of any other Aboriginal people who may hold cultural knowledge as required under clause 80C of the National Parks and Wildlife Regulation 2009.

#	Organisation	Contact Name	Phone Number	Contact Address
1	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
3	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
4	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
5	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
6	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
7	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
8	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
9	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
10	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

11	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
12	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
13	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
14	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
15	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
16	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
17	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
18	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
19	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
20	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
21	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
22	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
23	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
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File no: C15/30955
145-537-1

23 July 2015

Sydney Zoo Aboriginal Heritage Assessment, Bungarrabee, NSW

Thank you for your letter dated 29 June 2015 regarding Aboriginal stakeholders relevant to the proposed development at Bungarrabee. Attached is Council's list of Western Sydney Aboriginal stakeholder groups.

Should you require any further information regarding this matter, please contact Council's Planning Policy team on (redacted).

Western Sydney Aboriginal Stakeholder Groups

Stakeholder group	Contact	Address	Phone	Email/website
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

Registrations of Interest

This appendix has been removed from the public version of this document

Assessment Methodology



artefact

17 March 2016

Re: Sydney Zoo, Bungarribee: Project information and methodology for Aboriginal Cultural Heritage Assessment Report.

Thank you for registering as a stakeholder for the Sydney Zoo Project, Bungarribee Precinct, Western Sydney Parklands.

Sydney Zoo (the proponent) propose to construct a zoo within the southern section of the Bungarribee Precinct, Blacktown. Sydney Zoo is intended to provide a major tourism attraction for the Western Sydney region. The development will improve access to Bungarribee Precinct and provide recreational facilities for a range of user groups. It will also promote bushland regeneration and conservation within Bungarribee Precinct.

Artefact Heritage recently prepared an Aboriginal archaeological survey report (ASR) for the proposed development. Areas of Archaeological potential were located in the western portion of the study area adjacent to the creek as well as on the crest landform located to the east (Figure 2). The areas of archaeological potential have been designated as Sydney Zoo PAD1 (SZ PAD1) and Sydney Zoo PAD2 (SZ PAD2) respectively.

The impact assessment within the ASR identified that the proposed zoo will impact AHIMS sites # 45-5-0465, 45-5-0455, 45-5-4433, SZ PAD1 and SZ PAD 2. The ASR found that no further archaeological investigation of AHIMS sites 45-5-0455, 45-5-0465 and 45-5-4433 is recommended. As the likely archaeological significance of SZ PAD1 has been determined based on archaeological salvage excavation in a comparable landform at Bungarribee North, archaeological test excavation in that portion of SZ PAD1 that will be impacted has not been recommended.

Archaeological test excavation in accordance with the OEH code of practice is recommended at SZ PAD2 to determine the extent and archaeological significance of that area. Following completion of archaeological test excavation at SZ PAD2, a report would be prepared that outlines the findings of the investigation and assesses the archaeological significance of the PAD. The test excavation methodology is attached for your review and comment.

Following the completion of archaeological test excavation at SZ PAD2, an Aboriginal Cultural Heritage Assessment Report (ACHAR) would be prepared for the study area that includes the results of consultation with registered Aboriginal stakeholders, an assessment of cultural significance, a final impact assessment and management measures for the proposal.

Using information compiled from the ASR and upcoming test excavation, the ACHAR will provide a description of the environmental background, proposed works, nature and extent of Aboriginal cultural heritage material, and impact assessment. The ACHAR will also outline details of Aboriginal stakeholder consultation for the project, which is being conducted in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

To prepare the ACHAR, Artefact Heritage is seeking information on the cultural value to Aboriginal people, or places of cultural value, related to the subject area. Aboriginal stakeholders should advise Artefact Heritage of specific protocols and restrictions related to the knowledge provided concerning the cultural values of the subject area. If you would like to comment on the test excavation methodology and ACHAR methodology, could you please contact me with the below details:

Sydney Zoo, Bungarribee: Project information and methodology for test excavation and preparation of an Aboriginal Cultural Heritage Assessment Report

Sydney Zoo
c/o Veronica Norman
Artefact Heritage
Building B, Level 4, 35 Saunders Street
Pymont NSW 2009
Or email [veronica.norma @artefact.net.au](mailto:veronica.norma@artefact.net.au)

Please provide comments on the test excavation methodology and ACHAR methodology by COB Friday 15 of April, 2016.

Following the preparation of a draft version of the ACHAR, a copy will be forwarded to your organisation for review and comment. Following a review period and finalisation of the ACHAR, it will be included in the EIS for DPE approval.

Kind regards,
Veronica Norman

Figure 1: Location of study area



Figure 2: Location of SZ PAD1 and SZ PAD2

This figure has been removed from the public version of this document

1.0 TEST EXCAVATION METHODOLOGY

1.1 Test Excavation Scope

The scope of this archaeological test excavation methodology is SZ PAD2 (see Figure 1). This area of potential was identified during an Aboriginal archaeological survey report (ASR) of the site by Artefact Heritage in 2015 as part of the Sydney Zoo – Bungarribee Precinct construction project. The PAD has been recommended for test excavation in accordance with the OEH 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (the OEH code of practice). It is intended for this methodology to be read in conjunction with the ASR (attached).

The aim of this document is to outline the proposed methodology for archaeological test excavation of SZ PAD2.

1.2 Archaeological Test Excavation Guidelines

Archaeological test excavation will be conducted in accordance with the OEH code of practice. The OEH code of practice prescribes guidelines for archaeological test excavation, and outlines the amount of excavation allowed in a particular area, the size of the test pits, and the way in which they are excavated. The code of practice provides a standard methodology which can be used to effectively compare data sets from other sites in the locality and does not require an AHIP.

1.3 Areas for Archaeological Test Excavations

The AHA identified two areas of PAD that may be impacted by the proposal, SZ PAD1 and SZ PAD2 (see Figure 1). The scope of the proposed test excavations only covers SZ PAD2 as the likely archaeological potential of SZ PAD1 has already been determined based on archaeological salvage excavation in a comparable landform at Bungarribee North.

1.4 Aims of Test Excavation

The archaeological field survey conducted for the current study area observed very low surface visibility across the proposal site. This was largely due to dense grass cover. Due to this low surface visibility in most areas, landform observations and information from previous archaeological investigations were used to inform the selection of areas of PAD.

SZ PAD2 is located on a crest landform approximately 275 m east of Eastern Creek. The crest represents a unique landform within the Bungarribee district that has not been previously investigated.

In accordance with the OEH code of practice the aims of archaeological test excavations are:

- To adequately identify the extent of SZ PAD2.
- To assess the scientific significance of SZ PAD2 following an assessment of the test excavation results.
- To provide an opportunity for registered Aboriginal stakeholders to comment on the Aboriginal cultural heritage values of the site.
- To provide the proponent with recommendations on opportunities to avoid impact and future requirements for further archaeological investigation where required.

Figure 1: Location of SZ PAD1 and SZ PAD2

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1.5 SZ PAD1

Due to the fact that the majority of SZ PAD1 will not be impacted, and the association of that landform with previously excavated areas in Bungarribee Precinct, no test excavation in accordance with the OEH code of practice has been recommended within SZ PAD1. The likely nature and significance of SZ PAD1 has been established from salvage excavation 280 m to the northeast for Sydney Water and 800 m to the north on the Eastern Creek floodplain for Western Sydney Parklands Trust (WSPT).

Mitigation measures outlined in the Aboriginal Cultural Heritage Assessment Report (ACHAR) will advise the proponent of any archaeological salvage excavation that may be required within the impacted portions of SZ PAD1.

1.6 Excavation Methodology

Archaeological test excavation would be conducted at the site with the aim of testing the extent and nature of potential sub-surface Aboriginal objects.

The basis of the test excavation would be hand excavation 50 centimetre x 50 centimetre excavation units. These would be spaced out between 10 and 15 metres apart on transects laid out generally on an east-west orientation across the PAD. To adequately test the boundaries of the PAD, some test excavation units may be laid around the margins of the delineated boundary of SZ PAD2.

It is estimated that approximately 20-30 excavation units will be completed during the test excavation phase. The location of the test pits would be at the discretion of the site supervisor and Aboriginal stakeholder representatives on site, and may exclude areas that are unsuitable for excavation at the time of testing. This would provide an adequate sample of the site and provide a clear indication to the extent and characteristics of sub-surface archaeological deposit.

The distribution and total number of test pits is a guide only and may include a varying number of pits to that shown at the discretion of the supervising archaeologist in the field. Examples of circumstances that may alter the timing and total number of pits at the site include the depth of deposit, the hardness of deposit, any encountered areas of contamination, and access issues.

The OEH code of practice outlines requirements for when enough information has been retrieved and test excavation must cease. Test excavation at the site must cease when (OEH 2010:28):

- 'Suspected human remains are encountered'
- 'Enough information has been recovered to adequately characterise the objects present with regard to their nature and significance'

'Enough information' is defined by OEH (OEH 2010:28) as '...the sample of excavated material clearly and self-evidently demonstrates the deposit's nature and significance, and may include things like:

- Locally or regionally high object density.
- Presence of rare representative objects.
- Presence of archaeological features or locally or regionally significant deposits, stratified or not.'

The determination of whether there is enough information to stop excavation would be made in the field following discussions between the site supervisor and Aboriginal stakeholder representatives present in the field at that time.

1.6.1 Excavated Area

Under the OEH code of practice guidelines for test excavation, no more than 0.5% of each investigated location can be excavated without an AHIP. A summary of the areal total of the area and proposed total excavation area is outlined in Table 1 below.

Table 1: Proposed total excavated area for the PAD

PAD	Total square metres	Proposed excavation area (metres ²)	Proposed excavated percentage of total area
SZ PAD2	5578	7.5	0.13

1.6.2 Excavation Procedure

Transects and excavation squares would be laid out using long hand-tapes, flags and pegs. An initial baseline would be laid out at each location, and trigonometry used to lay out parallel transects and offset excavation squares. A flag and peg would be placed at each point to be tested, and hand tapes and pegs used to lay out the remaining pegs at each corner of the excavation units. A datum would be established at the first excavation unit on the baseline. The location of each excavation unit would be recorded using a hand-held non-differential GPS, and the magnetic bearing of the first transect recorded using a compass. An arbitrary site grid would be established at the datum.

In accordance with the OEH code of practice, the initial excavation unit would be excavated in 5 centimetre spits. Subsequent excavation units will be excavated in 10 centimetre spits to the base of the artefact bearing deposit. Where time allows and further investigation is required for particular areas, the code of practice allows for excavation units to be combined to open an area no larger than three square metres. The location of small open area excavations at the site would be at the discretion of the supervising archaeologist in consultation with Aboriginal stakeholder representatives in the field.

A context sheet for each excavation unit would be completed in the field. Details recorded will include date of excavation, name of excavators, depth, number of buckets and soil description. Additionally, one representative section wall from each excavation unit will be scale drawn, and photographs will be recorded of each section wall and base.

All retrieved deposit from each excavation unit would be placed in buckets and transported to a sieve area using wheelbarrows. All retrieved deposit would be sieved using nested 5 millimetre and 3 millimetre sieves.

All excavation units would be back-filled with clean fill and sieve spoil following the completion of test excavation using a rubber tracked back-hoe or similar plant.

1.6.3 Wet Sieving

It is anticipated that all of the excavated soils will be wet sieved as opposed to dry sieving. Wet sieving will involve establishing silt fencing where necessary to stop the flow of sediment loaded

water into any neighbouring watercourse. Erection of silt fencing will involve the placement of wooden stakes in the ground at set intervals to support the silt fence.

Management of sieved spoil at the site will be arranged with Sydney Zoo, and may involve collection of some of that material and back-fill into excavated pits using a rubber tracked back-hoe or similar plant. It is likely that some sieve spoil will remain on the ground surface following completion of the test excavation program.

1.6.4 Fencing Off Open Excavation Units

Arrangements for the necessity of fencing off open excavation units overnight will be discussed with Sydney Zoo for the site. Depending on public accessibility to the test excavation area, marking out open excavation units may require high-visibility fencing around wooden stakes or metal star pickets. Where there is no public access, a flag at one corner of the pit may suffice.

1.6.5 Procedure for the Discovery of Human Remains

Under the OEH code of practice archaeological test excavation must cease when suspected human remains are encountered.

If suspected human skeletal remains are uncovered at any time throughout the excavation program, the following actions will be followed:

- Cease all excavation activity;
- Notify NSW Police;
- Notify OEH via the Environment Line 131 555 to provide details of the remains and their location, and;
- Excavation activity will not recommence unless authorised in writing by OEH.

1.6.6 Reporting and Aboriginal Objects

All Aboriginal objects retrieved during the course of test excavation would be washed and placed in re-sealable bags for further analysis and recording. Once test excavation has been completed, the artefact assemblage would be recorded and stored as stipulated in the OEH code of practice. This includes recording key attributes of material, artefact type, platform type, termination type and dimensions, as well as photographic and drawn records of representative artefacts. All recorded information would be entered into a Microsoft Excel table with detail linked to the provenance of each artefact. Once entered the Excel table, the data can be readily supplied with the test excavation report to OEH and registered Aboriginal stakeholders in either electronic or hard-copy form. An archaeologist experienced in stone artefact recording will conduct the attribute recording and analysis.

All artefacts would be given a unique number and stored in double re-sealable snap lock bags. A permanent marker will be used to record the provenance and unique number of artefacts in each bag in writing on the outside of the bag and on an archival grade tag such as Dupont™ Tyvek® paper.

Long-term care and management of the retrieved archaeological assemblage will be discussed with Aboriginal stakeholders through the methodology review process and preparation of the ACHAR.

Comments on the Assessment Methodology

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Comments on the Draft ACHAR

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Appendix D: Archaeological Survey Report

Sydney Zoo Bungarribee Precinct

Aboriginal Archaeological Survey
Report

Report to Sydney Zoo

March 2016



Artefact Heritage
ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au

EXECUTIVE SUMMARY

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

The project was declared to be State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

In accordance with the SEARs Artefact Heritage has conducted an Aboriginal heritage assessment in order to document and assess Aboriginal cultural heritage and any impacts within the study area. This assessment was conducted in accordance with the Office of Environment and Heritage (OEH) 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010), the Department of Environment and Conservation (now OEH) *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010).

Overview of findings

- Three previously recorded Aboriginal sites are located within the study area (AHIMS sites # 45-5-0455, #45-5-0465 and # 45-5-4433). These sites were assessed as demonstrating low archaeological significance.
- Two areas of Potential Archaeological Deposit (PAD) were identified during the study (SZ PAD1 and SZ PAD2).
- Disturbance was generally assessed to be low with the exception of the modified drainage channel and pipeline located in eastern and western portion of the study area respectively.

Recommendations

It is therefore recommended that:

- No further archaeological investigation of AHIMS sites 45-5-0455, 45-5-0465 and 45-5-4433 is recommended.
- As the likely archaeological significance of SZ PAD1 has been determined based on archaeological salvage excavation in a comparable landform at Bungarribee North, archaeological test excavation in that portion of SZ PAD1 that will be impacted is not required.
- Archaeological test excavation in accordance with the OEH code of practice as best practice is recommended at SZ PAD2 to determine the extent and archaeological significance of PAD in that area.
- Following completion of archaeological test excavation at SZ PAD2, a report would be prepared that outlines the findings of the investigation and assesses the archaeological significance of the PAD.

- Following the completion of archaeological test excavation and reporting at SZ PAD2, an Aboriginal Cultural Heritage Assessment Report (ACHAR) would be prepared for the study area that includes the results of consultation with registered Aboriginal stakeholders, an assessment of cultural significance, a final impact assessment and management measures for the proposal.
- The ACHAR would include an outline of what mitigation and management measures would be required within that portion of SZ PAD1 impacted by the extension of the car park into that area.
- If changes are made to the proposed works which may impact any area not investigated in this ASR, further archaeological investigation may be required.

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

The project was declared to be State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

In accordance with the SEARs Artefact Heritage has conducted an Aboriginal heritage assessment in order to document and assess Aboriginal cultural heritage and any impacts within the study area. This assessment was conducted in accordance with the Office of Environment and Heritage (OEH) 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010), the Department of Environment and Conservation (now OEH) 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' (2005) and 'Aboriginal Cultural Heritage Consultation Requirements for Proponents' (2010).

1.2 The Study Area

The study area is located in the southern portion of Lot 101/ DP1195067 within the Blacktown City Local Government Area (LGA). It is bounded by Eastern Creek to the west, Doonside Road to the east and the Great Western Highway to the south (Figure 1). The study area is 16.5 hectares.

1.3 The proposal

The proposal includes the development of the land within the study area into a world class zoo exhibiting a wide range of popular animal species. The facility will provide an immersive safari-like experience including open grassland areas, elevated walkways and boardwalks, reptile and nocturnal animal houses, aquarium and infrastructure to service 30+ exhibits. Education and conservation programs planned for the Zoo are intended to provide a focus on local heritage values including natural and Aboriginal heritage.

The proposed development of Sydney Zoo will include.

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals.
- Back-of-house buildings for exhibits.
- Main entrance building comprising entry/exit, and gift shop.
- Restaurant and café.
- Kiosks and amenities.
- Show arena.
- Picnic areas and gardens.
- Wetlands and waterways.
- Service building containing:
 - Administration areas;
 - Curatorial and food preparation areas; and
 - Veterinarian space.

- Service yard with maintenance shelter.
- Main formal carpark on asphalt 387 vehicles, overflow on asphalt road 88 vehicles (total on asphalt 475 vehicles), overflow on gravel 800 vehicles, disabled spots 9 vehicles, total parking 1284 vehicles. Access via an internal road connecting to the Great Western Highway.
- Bus parking.

Construction of the project is expected to take approximately 8 – 12 months to complete.

Figure 1: Location of the study area



Figure 2: Proposed Sydney Zoo layout



1.4 Objectives of Assessment

The objective of the assessment is to meet the requirements of the Secretary's Environmental Assessment Requirements (SEARs). In accordance with the SEARs Artefact Heritage has conducted an Aboriginal Cultural Assessment in order to document and assess both Aboriginal cultural heritage and any impacts within the study area. This assessment was conducted in accordance with the Office of Environment and Heritage (OEH) 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010), the Department of Environment and Conservation (now OEH) 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' (2005) and 'Aboriginal Cultural Heritage Consultation Requirements for Proponents' (2010). The main objectives of this study include providing:

- A description of the proposal and the extent of the study area.
- Discussion of the environmental context of the study area.
- Discussion of the Aboriginal and historical context of the study area.
- A summary of the archaeological context of the study area including a discussion of previous archaeological work in the area.
- Development of an archaeological predictive model.
- Registration of Aboriginal stakeholders.
- Results of the archaeological survey.
- Description and analysis of the identified Aboriginal sites within the study area.
- Development of a significance and impact assessment of the identified Aboriginal site, addressing archaeological values.
- Development of management and mitigation measures.
- Recommendations relating to the further mitigation of potential impacts to the identified site.

1.5 Investigator and Contributions

Artefact Heritage archaeologists Josh Symons and Claire Rayner conducted this assessment. Claire Rayner and Alyce Haast prepared this report with management input from Doctor Sandra Wallace, Principal Archaeologist at Artefact Heritage.

2.0 ABORIGINAL COMMUNITY INVOLVEMENT

Comprehensive Aboriginal stakeholder consultation for the proposal has been conducted by Artefact Heritage on behalf of Sydney Zoo (the proponent). As a SSD project under Part 4 Division 4.1 of the EPA Act, consultation has been conducted in accordance with the Department of Environment and Conservation (now OEH) *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005). The OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) have been used as best practice guidelines for the stakeholder registration process.

In accordance with Step 4.1.2 of the consultation requirements Artefact contacted the following organisations to request the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the Bungaribee Precinct:

- Aboriginal heritage department of the Metropolitan OEH
- Deerubbin Local Aboriginal Land Council (DLALC)
- The Registrar, *Aboriginal Land Rights Act 1983*
- National Native Title Tribunal
- NTSCORP
- Blacktown City Council
- Greater Sydney Catchment Management Authority

In accordance with Step 4.1.3 of the consultation requirements, an advertisement was placed in the Blacktown Sun on 30 June 2015. The advertisement invited all Aboriginal persons and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places in the subject land to register their interest by 5 August 2015.

In accordance with Step 4.1.3 of the consultation requirements, letters were sent to all Aboriginal persons or organisations identified through responses from agencies contacted as part of Step 4.1.2. The letters provided details about the location and nature of the proposal, as well as an invitation to register as an Aboriginal stakeholder.

Following the completion of steps 4.1.2 and 4.1.3 forty-five Aboriginal stakeholders registered as persons or organisations that may hold cultural knowledge relevant to determining the Aboriginal cultural values of the study area. The registered Aboriginal stakeholders included:

- [REDACTED]

3.0 ENVIRONMENTAL CONTEXT

3.1 Geology

The underlying geology of the study area consists of late Triassic period shale deposits across the gently sloping raised terrain bordering Quaternary period alluvial deposits associated with Eastern Creek. The underlying Bringelly Shale deposit across the raised land in the eastern portion of the study area generally consists of shale, claystone, laminate, lithic sandstone, rare coal and tuff (Clark and Jones 1991). The Quaternary alluvium associated with the lower terrain bordering Eastern Creek generally consists of fine-grained sand, silt and clay (Clark and Jones 1991).

Plumpton Ridge, a geological formation bordering the western side of Eastern Creek approximately six kilometres northwest of the study area is identified a significant silcrete extraction site.

3.2 Soils

Overlying soils consist of residual soils developed in situ across the raised portions of the study area associated with the underlying Bringelly Shale. The residual soils, called the Blacktown soil landscape, generally consist of shallow duplex soils over a clay base. Overlying fluvial soils were associated with the alluvium across the low-lying terrain bordering Eastern Creek. The fluvial soils, called the South Creek soil landscape, are likely to be subject to frequent flood events.

A significant feature of the regional geological landscape includes a significant source of silcrete at Plumpton Ridge, approximately six kilometres northwest of the study area. Silcrete, a raw material used by Aboriginal people across Sydney Basin, was extracted from underlying Tertiary period geology called the St Marys formation. The silcrete raw material source at Plumpton Ridge was an important and extensively used quarry where extraction and tool manufacture activities took place (JMCD CHM 2006a).

3.3 Hydrology

The study area is located across slope and flat landforms bordering Eastern Creek. The southern half of the study area is located across slopes associated with undulating terrain in the southeastern corner of Bungaribee Precinct.

Eastern Creek is a major watercourse across the Cumberland Plain that flows north into South Creek in the Marsden Park area. Bungaribee Creek, to the north of the study area, is a second order watercourse that flows northwest from the Prospect area into Eastern Creek.

3.4 Natural Resources

The study area would once have been covered by open Cumberland Plain Woodland, which is typical of the Wianamatta Group shale geology. Tree species would have included Forest Red Gum (*E. tereticornis*), and Grey Box (*E. moluccana*) (Benson and Howell 1990).

Aboriginal people were highly mobile hunter-gatherers utilising different landform units and resource zones. Different resources may have been available seasonally, necessitating movement or trade (Attenbrow 2010: 78). Aboriginal people hunted kangaroo and wallaby and snared possums for food and skins. In marine or estuarine environments Aboriginal people caught fish and collected shellfish. There are many accounts by Europeans of Aboriginal people in canoes on rivers and the ocean, fishing and cooking the fish on small fires within the vessels (e.g. Collins 1798).

Plants were an important source of nutrition, common edible species being *Macrozamia*, a cycad palm with poisonous seeds that were detoxified and ground into a paste and *Xanthorrhoea*, or grass tree. The grass tree nectar was a high-energy food, the resin strong hafting glue, and the flower spikes used for spear barbs. From observations by early European colonists, only about twenty species of plant are identified as being used for food or manufacture by Aboriginal people of the Sydney region (Attenbrow 2010:41). It is likely this is only a fraction of what was actually used.

3.5 Land Use History

From 1802 the Bungarribee area formed part of the Rooty Hill Government Farm. While the focus of farm activities was north of the Bungarribee Precinct on Rooty Hill, the area had begun to be cleared to provide pasture for government herds. From 1822 the north eastern portion of the Precinct comprised a single grant to Colonel John Campbell who built a homestead and several outbuildings to the north of the Bungarribee Precinct. The Bungarribee Estate passed through a number of hands and was used as a horse stud (1828 to 1945) and as a remount depot for the East India Company for horses to be shipped to India for use by the British cavalry (1845 to 1846).

The north western portion of the Precinct was subdivided from the 1840s. These subdivisions fronted Belmore Street, east of the Bungarribee Precinct. The area within the Precinct comprised the back half of each subdivision and has been subject to a low level of disturbance, aside from the construction of outbuildings. In the 1900s a dairy farm existed within the north western portion of the Precinct. The south western portion of the Precinct developed as part of the Eastern Creek village. From the 1880s a commercial strip fronted the Great Western Road and included a post office and a blacksmiths shop.

During World War II (WWII) the whole Bungarribee Precinct was resumed for use as a RAAF dispersal area. The dispersal area comprised a sealed landing strip, taxiways and hides (aircraft dispersal pads). Jo McDonald Cultural Heritage Management (JMcDCHM) (2007) suggests that the gravels used in the construction of the landing strip were sourced from Plumpton Ridge, about five kilometres northwest of the Precinct.

In the 1949 the Overseas Telecommunications Commission (OTC) resumed the Bungarribee precinct for use as a transmission station. A transmission station was built in the central portion of the Precinct and a series of transmission towers or aerials were erected across the OTC land holding. The OTC station was closed in the 1990s, telecommunication technologies having surpassed the need for radio transmission. The transmission towers were removed and the station demolished in 2001.

Previous land use has caused a moderate level of disturbance to the Precinct. The clearing of native vegetation between 1802 and circa 1840 has caused a moderate level of disturbance across the Precinct. There are also a number of isolated incidences of high disturbance, for example in the south and west where roads have been constructed and in the central portion of the Precinct where the RAAF landing strip, taxiways and hides and OTC transmission station were built.

4.0 ABORIGINAL HISTORICAL AND ARCHAEOLOGICAL CONTEXT

4.1 Aboriginal Material Culture

Aboriginal people have lived in the Sydney area for more than 20,000 years. The oldest securely dated site in the greater Sydney region is 17,800 years before present (yBP), which was recorded in a rock shelter at Shaw's Creek (Nanson et al 1987). Evidence of Aboriginal occupation has been found dated to 50-60,000 yBP at Lake Mungo in NSW, so it is likely that Aboriginal people have lived in the Sydney region for even longer than indicated by the oldest recorded dates we have at present. The archaeological material record provides evidence of this long occupation, but also provides evidence of a dynamic culture that has changed through time.

The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts. Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000yBP in the Sydney region (Attenbrow 2010:102). It is argued that these changes in material culture were an indication of changes in social organisation and behaviour.

The Eastern Regional Sequence was first developed by McCarthy in 1948 to explain the typological differences he was seeing in stone tool technology in different stratigraphic levels during excavations such as Lapstone Creek near the foot of the Blue Mountains (McCarthy 1948). The sequence had three phases that corresponded to different technologies and tool types (the Capertian, Bondaian and Eloueran). The categories have been refined through the interpretation of further excavation data and radiocarbon dates (Hiscock & Attenbrow 2005, JMcDCHM 2005). It is now thought that prior to 8,500 yBP tool technology remained fairly static with a preference for silicified tuff, quartz and some unheated silcrete. Bipolar flaking was rare with unifacial flaking predominant. No backed artefacts have been found of this antiquity.

After 8,500 yBP silcrete was more dominant as a raw material, and bifacial flaking became the most common technique for tool manufacture. From about 4,000yBP to 1,000yBP backed artefacts appear more frequently. Tool manufacture techniques become more varied and bipolar flaking increases (JMcD CHM 2006a). It has been argued that from 1,400 to 1,000 years before contact there is evidence of a decline in tool manufacture. This reduction may be the result of decreased tool making, an increase in the use of organic materials, changes in the way tools were made, or changes in what types of tools were preferred (Attenbrow 2010:102). The reduction in evidence coincides with the reduction in frequency of backed blades as a percentage of the assemblage.

After European colonisation Aboriginal people of the Cumberland Plain often continued to manufacture tools, sometimes with new materials such as bottle glass or ceramics. There are several sites in Western Sydney where flaked glass has been recorded, for example at Prospect (Ngara Consulting 2003) and Oran Park (JMcD CHM 2007a).

4.2 Aboriginal Ethno-historic Context

Prior to the appropriation of their land by Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. It seems that territorial boundaries were fairly fluid, although details are not known. The language group spoken on the Cumberland Plain is known as Darug (Dharruk – alternative spelling). This term was used for the first time in 1900 (Matthews & Everitt) as before the late 1800s language groups or dialects were not discussed in the literature (Attenbrow 2010:31). The Darug language group is thought to have extended from Appin in the south to the Hawkesbury River, west of the Georges River, Parramatta, the Lane Cove River and to Berowra Creek (Attenbrow 2010:34). This area was home to a number of different clan groups throughout the Cumberland Plain.

British colonisation had a profound and devastating effect on the Aboriginal population of the Sydney region, including Darug speakers. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources. Overall the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic over half of the Aboriginal people of the Sydney region died. The disease spread west to the Darug of the Cumberland Plain and north to the Hawkesbury. It may have in fact spread much further afield, over the Blue Mountains (Butlin 1983). This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them, or record their clan names (Karskens 2010:452).

The British initially thought that Aboriginal people did not live inland, but were confined to the coast taking advantage of the abundant marine resources available. The first major expeditions into the interior did not witness any Aboriginal people, but evidence of their existence was noted. In April 1788 Governor Philip led an expedition west to Prospect Hill. It was noted, ‘...that these parts are frequented by the natives was undeniably proved by the temporary huts which were seen in several places. Near one of these huts, the bones of kangaroo were found, and several trees where seen on fire’ (Stockdale 1789).

In 1789 Captain Watkin Tench led an expedition to the Nepean River. He noted that:

Traces of the natives appeared at every step, sometimes in their hunting huts which consist of nothing more than a large piece of bark bent in the middle and opened at both ends, exactly resembling two cards set up to form an acute angle; sometimes in marks on trees which they had climbed; or in squirrel-traps....We also met with two old damaged canoes hauled up on the beach. (Tench 1789)

It wasn't until rural settlement began in the western Cumberland Plain, around 1791 that the colonists and Aboriginal peoples came face to face. Relations quickly disintegrated, and tensions over land and resources spilled over. Governor King sanctioned the shooting of Aboriginal peoples in a General Order made in 1801 (Kohen 1986:24). Intermittent killings on both sides continued for over 15 years, including the Appin massacre and attacks at South Creek in 1816 (Karskens 2010: 225, Kohen 1986:23).

Although tensions existed between Aboriginal people and Europeans on the Cumberland Plain, a number of Aboriginal families continued to live semi-traditional lives in the area. The first parcels of land granted to an Aboriginal person were to the north-west of the study area between Richmond Road and Plumpton Ridge along Bells Creek. Governor Macquarie granted this land to Colebee and

Nurragingy in 1819. Colebee did not stay long but Nurragingy lived on the land and it remained in the family until 1920 when it was resumed by the Aboriginal Protection Board (Kohen 1986:27).

The government policy of removal of Aboriginal children from their parents in order to assimilate them into white society began fairly early on in the colony's history, and was epitomized by the development of the Native Institution at Parramatta in 1814. This facility was moved to the Black Town settlement in 1823 approximately six kilometres north-west of the current study area. It was closed in 1829 and the land was used for farming, but the site remains significant for its historical, archaeological and social values (GML 2010:36).

Into the nineteen and twentieth centuries descendants of Darug language speakers continued to live in Western Sydney along with Aboriginal people from other areas of NSW. The Aboriginal groups in their comments on this study will address the contemporary cultural, social and spiritual meanings of the locality.

4.3 OEH AHIMS site register search

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Figure 3: Results of OEH AHIMS site register search

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Figure 4: AHIMS sites within study area

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4.4 Overview of Previous Archaeological Investigations

4.4.1 Regional archaeological context

The study area is located in a region that has been subject to frequent archaeological investigations. Early investigations within the Blacktown area included research conducted by Jim Kohen as part of PhD research and an investigation of Aboriginal sites for Blacktown City Council (Kohen 1986). Kohen's (1986) investigation for Blacktown City Council included a sample survey of four areas within the LGA, including an area around Prospect Reservoir, Erskine Park, Marsden Park and along Ropes Creek. Using data gathered from the four sample survey areas, and previously recorded Aboriginal sites within the LGA, Kohen (1986: 67) determined that there were 25 identified major archaeological sites within the Blacktown LGA, with a major site defined as containing more than 50 recorded artefacts.

Silcrete raw material was identified at all 25 of the major archaeological sites, with other raw materials present in varying frequencies including chert, quartz, silicified wood, basalt and quartzite. All of the major archaeological sites were located either adjacent to a watercourse or on a ridge landform. Kohen (1986: 75) noted that the majority of identified major archaeological sites were located within 50 metres of a reliable watercourse, and that 'where a ridge or hill is situated close to a major creek, the high ground would generally be selected for the campsite'.

Although surface visibility tended to be very low, limiting the potential to identify surface artefacts, previous archaeological investigations further downstream along the Eastern Creek corridor have identified the area bordering the watercourse as generally demonstrating a high level of archaeological potential. Brown (2008) conducted an archaeological investigation for the replacement of a 132kV line through the Western Sydney Parklands from the northern boundary of Bungarribee Precinct for approximately five kilometres. Based on the results of previous archaeological investigations in the area and models of site distribution (such as Kohen 1986), Brown (2008: 18-20) considered that the entire area within 150 m of Eastern Creek associated with his study area was a PAD (EC132kVPAD).

Archaeological investigation of Plumpton Ridge, bordering the western side of Eastern Creek approximately six kilometres northwest of the study area, identified a significant silcrete extraction site and tool manufacturing area (JMCD CHM 2006a). The comprehensive archaeological investigation on the eastern side of Plumpton Ridge involved the excavation of 687 square metres across seven locations. These locations were representative of different landscape units within the study area and included floodplain, upper and mid slope and one site on a terrace/bank of Eastern Creek. The later site produced the highest density of artefacts, up to 1,289 per square metre. The excavation results indicated that the Plumpton Ridge quarry site was used extensively by Aboriginal people, though probably with greatest intensity over the last few thousand years (JMCD CHM 2006a: 136).

4.4.2 Previous archaeological investigations within Bungarribee Precinct

A number of archaeological investigations have been conducted within Bungarribee Precinct, including surveys by Jim Kohen as part of his PhD research in 1984 and as part of an investigation for Blacktown City Council in 1986, and more recent investigations by JMCD CHM (2006b; 2007; 2011). Several smaller investigations have also been undertaken within the Precinct and wider Parklands area as impact assessment studies and archaeological management studies (Haglund 1987; 2000; Navin Officer 1993; AMBS 2005; Artefact 2012).

Kohen's research within the Sydney Zoo Precinct

As part of his PhD research Kohen recorded a number of surface artefact scatters over the undulating land in the south eastern corner of the Bungarribee Precinct. Of these, two fall within boundary of the Sydney Zoo project, AHIMS sites 45-5-0455 and 45-5-0465.

JMcD CHM archaeological investigations within the Sydney Zoo Precinct

JMcD CHM's archaeological investigations into the Bungarribee Precinct included an initial survey and archaeological assessment (2006b), an Indigenous Heritage Impact Statement (2007), and archaeological excavation of a portion of potential archaeological deposit (PAD) identified in the earlier assessment (2011).

The initial survey and impact statement (2006b and 2007) identified that 52 recorded Aboriginal sites and five PADs were located across the Bungarribee Precinct. During that investigation the Precinct covered a much larger area than the current boundaries of Bungarribee Precinct, and included both the Bunya residential area (previously referred to as the Doonside residential parcel) to the northeast, and the Bungarribee industrial estate area to the south of the Great Western Highway (previously referred to as the Huntingwood West Employment Lands).

Figure 5: Location of PAD WSP1 within Bungarribee Precinct, yellow indicates good potential, with areas assessed as demonstrating greatest potential marked by white stars (JMcD CHM 2006b: 9)

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JMcD CHM (2007) developed a Strategic Management Model (SMM) for the Precinct, which identified sites and sensitive landscapes within the Precinct. A significant portion of the Precinct was designated Zone 1 (good archaeological potential) and delineated as PAD WSP1 (see Figure 5). JMcD CHM recommends that Zone 1 areas are avoided and that a possible Aboriginal heritage conservation area is declared. Other areas within the Precinct were assessed as Zone 3 (low archaeological potential). JMcD CHM recommended there are no constraints to development in those areas and no further archaeological works would be required. It is noted however, that Aboriginal stakeholders may want to monitor development within these areas, particularly along the creek lines.

Salvage excavation was recommended for portions of identified good and moderate archaeological potential that would be impacted by proposed development within Bungarribee Precinct (JMcD CHM 2007: 39).

Artefact Heritage Bungarribee Precinct Masterplan investigations

In 2014 Artefact prepared an ASR for the entirety of the Bungarribee Precinct as part of Aboriginal heritage investigations for the Bungarribee Precinct Masterplan. As part of that investigation a number of previously recorded Aboriginal sites were revisited and several previously unrecorded sites recorded.

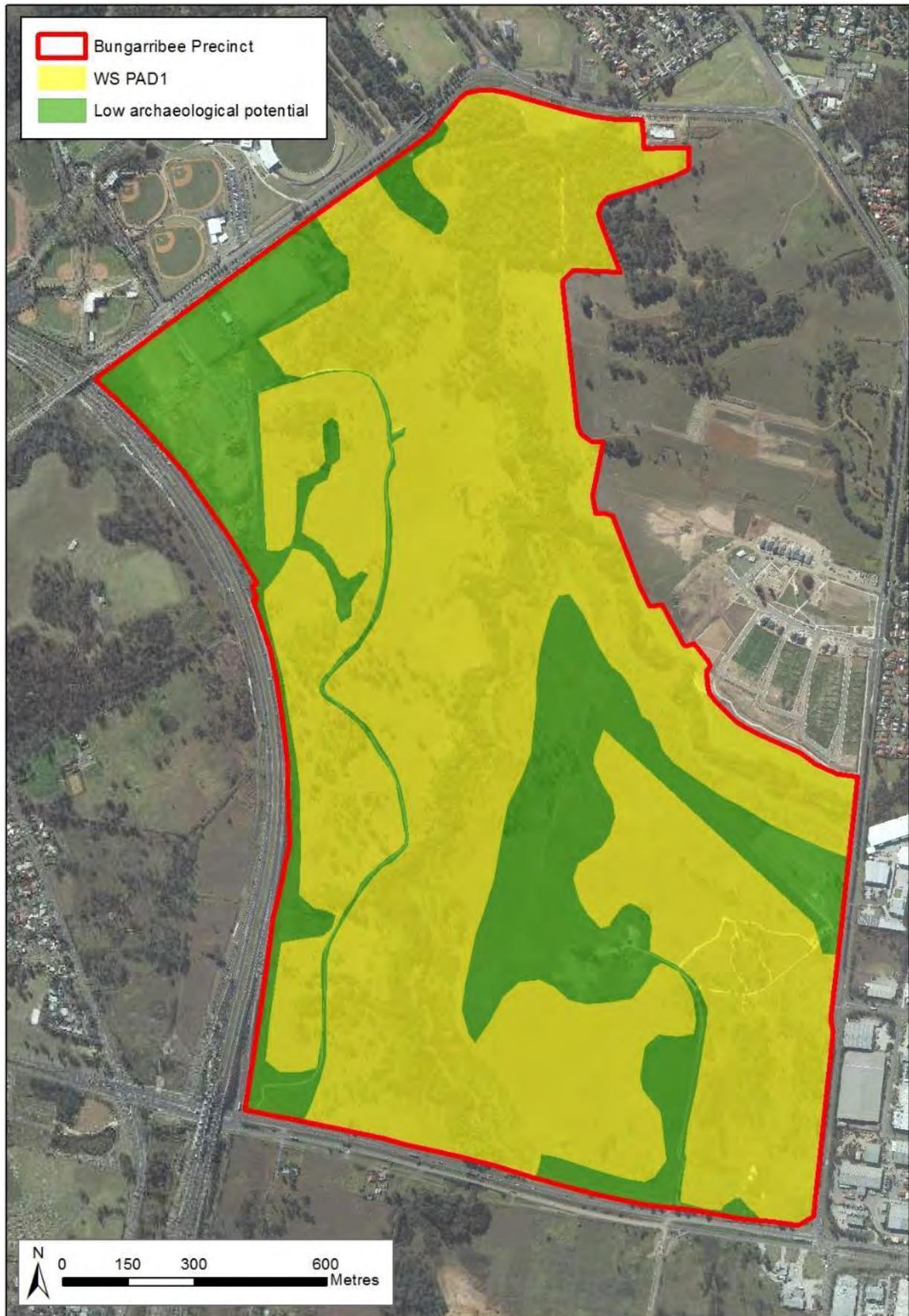
The ASR discussed previously recorded Aboriginal sites within the Precinct, as well as additional sites identified during the preparation of that ASR. The outcome of the ASR was the refinement, based on background research and sample archaeological survey, of the boundaries of PAD WSP1 (JMcD CHM 2006b). The refined extent of PAD WSP1, which was renamed “WS PAD1” for the purposes of that ASR, is shown in Figure 5.

Artefact (2014) noted that no areas of high archaeological potential were identified within the Precinct. This was based on the results of sub-surface investigation within the local area, including excavation at AHIMS site 45-5-2719 and 45-5-3255 within Bungarribee Precinct, and at 45-5-3883 adjacent to the eastern margin of the Precinct (a further description of archaeological excavation at these three sites is included in Section 4.4.3).

The landform context of AHIMS site 45-5-3883, which included a slope context in close proximity to Bungarribee Creek and the confluence of that creek with Eastern Creek, demonstrated a very high-density artefact scatter. In contrast, excavation at AHIMS site 45-5-3255 and 45-5-2719 further from Eastern Creek demonstrated much lower density artefact scatters. With localised exceptions the remainder of the Precinct was characterised by low-lying and gently undulating landform contexts bordering Eastern Creek and Bungarribee Creek.

Artefact (2015) identified the broad central portion of Bungarribee Precinct associated with Eastern Creek and Bungarribee Creek as demonstrating moderate archaeological potential (see Figure 6). It is likely that the density of potential sub-surface archaeological deposit in this zone would vary, with large areas of low density archaeological deposit interspersed with areas of higher density deposits.

Figure 6: Extent of WS PAD1 as delineated by Artefact (2014)



4.4.3 Previous archaeological excavations within Bungarribee Precinct (see Figure 7)

JMcD CHM 2011

A portion of WSPAD1 within the Bunya residential area, north of Bungarribee Creek, was excavated as part of impact mitigation prior to development of that area (JMcD CHM 2011). The portion of excavated PAD is recorded on the AHIMS sites register with the site name WSP PAD AHIMS #45-5-3883. A total of 41 one metre square pits and 82 square metres of open area was excavated within AHIMS #45-5-3883. The excavation retrieved a total of 5,535 artefacts, 1,083 pieces of silcrete and silicified tuff crenate affected by heat shatter, and 11,751 pieces of silcrete gravel.

No report for the excavation at AHIMS site 45-5-3883 was available at the time this document was prepared. A summary of excavation results is available on the site card for site 45-5-3883.

Artefact 2014b - Pipeline Salvage Excavation

In 2012, Artefact Heritage conducted a survey of a proposed wastewater trunk pipeline through the Bungarribee Precinct. Artefacts associated with three previously recorded Aboriginal sites (AHIMS #45-5-3253, #45-5-3255 and #45-5-3256) were identified on the pipeline. AHIMS #45-5-3255 and #45-5-3256 were assessed as demonstrating moderate archaeological significance with potential to provide information about Aboriginal occupation of the area. It was also determined that further investigation of these sites would enable comparisons to be made between past Aboriginal occupation within the Bungarribee Precinct and the local area. The salvage excavation covered the lower slope and terrace landform bordering the eastern side of the Eastern Creek floodplain.

AHIMS #45-5-3253 was assessed as demonstrating low archaeological significance due to the site being situated within a disturbed context. To mitigate impacts to Aboriginal cultural heritage by the proposed works, surface collection of visible artefacts at AHIMS #45-5-3255 and #45-5-3256 was recommended. Salvage excavation was also recommended for AHIMS #45-5-3255.

A total of 73 artefacts were retrieved from 35 salvage excavation squares across AHIMS #45-5-3255, and 17 artefacts were retrieved from surface collection across AHIMS #45-5-3256. No artefacts were retrieved from surface collection across AHIMS #45-5-3253.

Artefact 2015 – Bungarribee Precinct Masterplan Salvage Excavation

Following archaeological survey and assessment of the Bungarribee Masterplan completed by Artefact in 2014, it was determined that 11 sites would be impacted as part of proposed works. Based on recommendations from Artefact, Archaeological salvage was included within the Operational Conditions of the AHIP. A total of fifty-five one x one metre excavation units were excavated within the study area in two locations named 'Bungarribee North' and 'Bungarribee South'.

The Bungarribee North salvage area was situated within the South Creek soil landscape which was associated with floodplains, valley flats and drainage depressions. A total of 287 stone artefacts, weighing a maximum total of 148.35 grams, were recovered from the Bungarribee North area as a result of the salvage excavations. The salvage excavations undertaken at Bungarribee North uncovered a moderate density stone artefact assemblage which exhibits some distinctive types of stone reduction activities. The stone artefact analysis has shown that knapping events have been undertaken in this location, particularly within the area of the Stage II excavations (this is where the majority of the formal tools were identified). The formal tool types are associated with the ASTT and are typical of a Bondaian assemblage (likely dating anywhere from 8,000 BP up until the contact period). Preference of raw material use for the production of formal tools is indicated as all of the tools were composed of mudstone. No silcrete tools were identified.

The Bungarribee South salvage area was situated within the Blacktown soil landscape which is associated with gently undulating rises on Wianamatta Group Shales. All of the units excavated within this area were located on slightly raised terrain associated with a first order watercourse flowing onto the Bungarribee and Eastern Creek floodplains. A total of 346 stone artefacts, weighing a maximum total of 935.76 grams, were recovered from the Bungarribee South area as a result of the salvage excavations.

The salvage excavations undertaken at Bungarribee South uncovered a low density stone artefact assemblage of small to medium size flakes, angular fragments and cores. One artefact was identified as having some scalar retouch with evidence of usewear and defined as an utilised flake. The raw materials utilised at the site are common in the region. No evidence of intensive occupation of the site or the manufacture of stone tools was discovered. The assemblage was interpreted as opportunistic general stone reduction and discard rather than intensive occupation or site use reflective of transient campsites related to the movement of Aboriginal people across the landscape.

The salvage excavations revealed that the landform contexts are associated with two different types of archaeological sites which exhibit different types of stone artefact reduction techniques or behaviours.

Figure 7: Location of previous archaeological excavations discussed in Section 4.4.3

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5.0 PREDICTIONS

5.1 Previous Predictive Models for the Study Area

Data including landscape context and artefact density from previous archaeological excavations on the Cumberland Plain has been synthesised to develop a model of site distribution (White and McDonald 2010). The model demonstrated a strong correlation between proximity to permanent water sources and site location, and also highlighted the relationship between topographical unit and Aboriginal occupation in the region.

The major findings of the study were that artefact densities were most likely to be greatest on terraces and lower slopes within 100 m of water. The stream order model was used to differentiate between artefact densities associated with intermittent streams as opposed to permanent water. It was found that artefacts were most likely within 50 to 100 m of higher (4th) order streams, within 50 m of second order streams, and that artefact distribution around first order streams was not significantly affected by distance from the watercourse (White and McDonald 2010: 33).

Overall, landscapes associated with higher order streams (2nd order or greater) were found to have higher artefact densities, higher maximum densities, and more continuous distribution than lower order intermittent streams. The analysis also concluded that while there were statistically viable correlations that demonstrated a relationship between stream order, land form unit and artefact distribution across the RHDA, the entire area should be recognised as a cultural landscape with varied levels of artefact distribution (White and McDonald 2010: 37).

JMcD CHM (2006b: 13) developed a predictive model specific to the Western Sydney Parklands (including the Bungarribee Precinct). JMcD CHM predicted:

- Based on the results of previous archaeological investigations within the Parklands, open stone artefacts would be the most common Aboriginal site identified within the Parklands. JMcD CHM (2006b: 13) predicted that stone artefact sites would be of varied size and densities with the largest being located near permanent water sources.
- Scarred trees would be a less common Aboriginal site type to be identified within the Parklands. JMcD CHM (2006b: 13) noted scarred trees may be identified in areas where there was old growth native vegetation.

5.2 Predictive Model for the Study Area

Archaeological data gathered in the locality has demonstrated the widespread and varying use of the area by Aboriginal people. This predictive model comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected in the study area. These statements are based on the information gathered regarding:

- Landscape context and landform units.
- Ethno-historical evidence of Aboriginal land use.
- Distribution of natural resources.
- Results of previous archaeological work in area.
- Predictive modelling proposed in previous archaeological investigations.

Predictive statements are as follows:

- Stone artefact scatters are the most likely Aboriginal site type to be identified within the study area. This has been demonstrated in previous archaeological investigations which have identified a series of sites across Bungarribee Precinct.
- There is potential for intact sub surface archaeological deposits with high densities of stone artefacts. This has been demonstrated through the archaeological excavation of WSP PAD1, north of Bungarribee Creek (JMcD CHM 2011).
- Based on the location of recorded Aboriginal sites within Bungarribee Precinct and on predictive models developed for the Cumberland Plain (White and McDonald 2010) the highest numbers of sites and sites with the highest densities of artefacts are likely to be located along Eastern Creek.
- In situ stone artefacts are likely to be located where there is least ground disturbance.
- Based on the natural resources available and the results of previous archaeological investigations, silcrete will be the dominant raw material of stone artefact assemblages.
- Where old growth native vegetation remains there is potential for scarred trees to be located. As there are few areas of remnant native vegetation there are few areas where this is possible.
- Visibility is likely to be low, obstructed by dense grass cover. Sites on the ground surface will be most obvious in exposed areas where vegetation has recently been cleared and/or on tracks.

6.0 FIELD METHODS

6.1 Site Definition

An Aboriginal site is generally defined as an Aboriginal object or place. An Aboriginal object is the material evidence of Aboriginal land use, such as stone tools, scarred trees or rock art. Some sites, or Aboriginal places can also be intangible and although they might not be visible, these places have cultural significance to Aboriginal people.

OEH guidelines state in regard to site definition that one or more of the following criteria must be used when recording material traces of Aboriginal land use:

- The spatial extent of the visible objects, or direct evidence of their location.
- Obvious physical boundaries where present, e.g. mound site and middens (if visibility is good), a ceremonial ground.
- Identification by the Aboriginal community on the basis of cultural information.

For the purposes of this study an Aboriginal site was defined by the recording the spatial extent of visible traces or the direct evidence of their location.

PADs are areas where sub-surface stone artefacts and/or other cultural materials are likely to occur (DECCW 2010:38). These areas may be associated with recorded sites but are often greater in extent taking in areas around the visible artefacts where there is a potential for further buried artefacts to exist. PADs may also be present where no visible artefacts are located. This may be the case when there is no ground surface visibility, but the area is seen to have a high likelihood of containing artefacts.

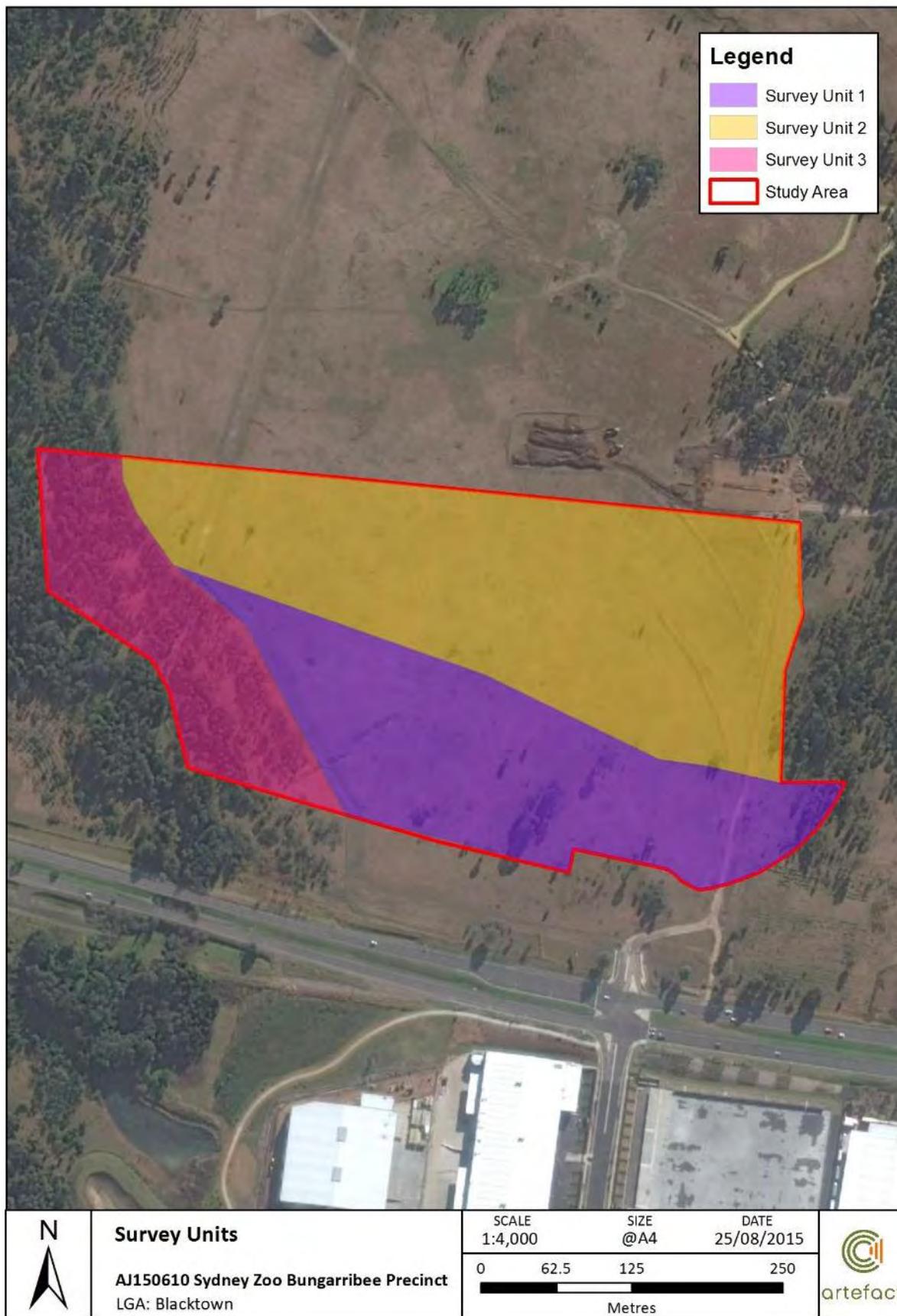
6.2 Survey Methodology and Limitations

A sample survey of the study area was undertaken on the 3 August 2015. The survey was undertaken in accordance with the OEH code of practice.

Survey units were delineated by the landforms within the study area (Figure 8). Given the poor visibility of the study area, the survey targeted areas of exposure. This was generally limited to tracks, tree bases and areas near the creek line.

All survey units were covered on foot and examined for stone artefacts or other traces of Aboriginal occupation. Aerial photographs and topographic maps of the study area were carried by all members of the survey team. A non-differential GPS was also used to track the path of the survey team and to record the geographical coordinates of Aboriginal sites and landscape features. A photographic record was also kept of the study area.

Figure 8: Delineation of survey units



7.0 SURVEY RESULTS

7.1 Effective Survey Coverage

The survey covered all three landform units identified within the study area, including slope, crest, and flat landform contexts. Effective survey coverage is outlined in Table 1 and landform survey coverage is outlined in Table 2.

Table 1: Effective survey coverage

Survey unit	Landform	Survey unit area (sq m)	Visibility (%)	Exposure (%)	Effective coverage Area (sq m)	Effective coverage (%)
Survey unit 1	Slope	54,510	5%	10%	272	0.5%
Survey unit 2	Crest	82,561	5%	10%	412	0.5%
Survey unit 3	Flat	27,881	5%	10%	139	0.5%

Table 2: Landform survey coverage

Landform	Landform Area (sq m)	Area effectively surveyed (sq m)	% of landform effectively surveyed	Number of sites
Slope	54,510	272	0.5%	2
Crest	82,561	412	0.5%	1
Flat	27,881	139	0.5%	0

8.0 SURVEY OBSERVATIONS

8.1 Survey Unit One

Survey unit one encompasses the slope landform that forms the southern half of the study area. The landform slopes south west towards Eastern Creek. Visibility within the survey unit was generally low and restricted to access tracks running along the eastern and western boundaries of the survey unit (Plate 1). Visibility was restricted due to dense grasses (Plate 2). Exposures were inspected for the presence of Aboriginal objects however none were identified. Two AHIMS sites (#45-5-0455 and #45-5-0465) are located within survey unit one. Disturbance was noted in the form of modified drainage channels cut into the lower slopes of the survey units near Eastern Creek (Plate 3).

Plate 1: Access track running along eastern boundary, survey unit 1



Plate 2: Poor visibility due to dense grass, survey unit 1



Plate 3: Artificial drainage channel, survey unit 1



8.2 Survey Unit Two

Survey unit two includes the northern crest landform overlooking Eastern Creek (Plate 4). The crest landform is relatively flat with a slight slope descending to the north. Visibility is generally nil within the study area with no areas of exposure identified (Plate 5). Visibility was inhibited by dense grass throughout the survey unit. Disturbance was noted in the form of furrows located in the north eastern region of the survey unit (Plate 6). There is one previously recorded AHIMS site located within the survey unit (#45-5-4433), there were no new sites identified within the survey unit. There was one area of PAD identified within the survey unit.

Plate 4: View west towards Eastern Creek, survey unit 2



Plate 5: Low visibility due to dense grass, survey unit 2



Plate 6: View north along furrow, survey unit 2



8.3 Survey Unit Three

Survey unit three encompasses the flat landform adjacent to Eastern Creek. Visibility in the area was nil with no exposures. Thick grass and trees inhibited visibility within the survey unit. Eastern Creek is a deeply incised creek line with raised terraces along its banks. Disturbance within the survey unit was generally found to be low and the landform was assessed to be in an intact and good condition. There is evidence of recent tree plantings occurring along the waterline. There were no newly identified sites located within the survey unit. The entirety of survey unit three was assessed to have the potential to contain intact archaeological deposits

Plate 7: Thick vegetation inhibited visibility within survey unit 3



Plate 8: Evidence of recent plantings, survey unit 3



9.0 SUMMARY OF RESULTS

The current survey delineated two specified areas of PAD contained within the wider WS PAD1 area originally defined by Jo McDonald (2006).

The coordinates of three registered AHIMS sites were inspected during the survey. The artefacts recorded at these sites were not relocated. Visibility was generally nil across the study area due to dense grass. Disturbance was limited to parts of the crest and slope landforms whilst the flat landform adjacent to Eastern Creek appears to be relatively intact.

9.1 Previously Recorded Archaeological Sites

9.1.1 AHIMS site 45-5-0455 Bungarribee 10 Blacktown

AHIMS site 45-5-0455 was originally recorded by Jim Kohen in 1984 as comprising a chert point, a chert flake and a silcrete flake.

AHIMS site 45-5-0455 is located on a formed vehicle track that leads north of the Great Western Highway into the Precinct. The track appears to have been repeatedly graded and formed with introduced materials.

No artefacts were identified at AHIMS site 45-5-0455 during the current field survey.

Plate 9: South west view of AHIMS 45-5-0455



Plate 10: West view of AHIMS 45-5-0455



9.1.2 AHIMS site 45-5-0465 Bungarribee 18 Blacktown

AHIMS site 45-5-0465 was originally surveyed by Jim Kohen in 1984 in which he recorded three silcrete artefacts and an utilised slab of local igneous rock over a 1m x 2m area adjacent to an artificial drainage ditch. It was noted in the original report that the site was located in a highly disturbed context.

AHIMS site 45-5-0465 was located across a gently sloping landform context. Surface visibility across the site area was limited due to dense grass cover. No Aboriginal objects were identified at AHIMS site 45-5-0465 during the current survey.

Plate 11: South view of AHIMS 45-5-0465



9.1.3 AHIMS site 45-5-4433 BP AS 6

AHIMS site 45-5-4433 was identified by Artefact in 2014 at the site coordinates originally attributed to AHIMS site # 45-5-3526 (WSP/10) described by JMcD CHM. The original recording of site WSP/10 described a total of 16 artefacts across an area of 80 m x 100 m, west of the former OTC site.

Whilst the actual location of WSP/10 based on the site description was likely to have been approximately 250 m further to the north, artefacts were identified by Artefact Heritage at the incorrectly listed AHIMS coordinates for site WSP/10 (302267E 6259337N). Two silcrete artefacts and numerous natural silcrete gravels were observed at this location and recorded as site BP AS 6.

No artefacts were identified at AHIMS site 45-5-0455 during the current field survey.

Plate 12: South west view of AHIMS 45-5-0465



Plate 13: North west view of AHIMS 45-5-0465



9.2 Potential Archaeological Deposits

Areas of Archaeological potential were located in the western portion of the study area adjacent to the creek as well as on the crest landform located to the east (Figure 5). The areas of archaeological potential have been designated as Sydney Zoo PAD1 (SZ PAD1) and Sydney Zoo PAD2 (SZ PAD2) respectively. Both areas of archaeological potential are described below.

9.2.1 SZ PAD1

PAD1 is located within survey unit three, the flat area adjacent to Eastern creek.

Previous investigations have highlighted the archaeological potential of Eastern Creek and bordering areas of higher elevation. The high archaeological potential of the Eastern Creek corridor was highlighted by Brown (2008), who labelled the entire area within 150 m of Eastern Creek as PAD. The Eastern Creek corridor is also closely associated with the significant silcrete raw material extraction site at Plumpton Ridge. Excavation identified staged silcrete extraction and tool manufacture activities across the eastern slope of Plumpton Ridge, culminating in extremely dense sub-surface archaeological deposit bordering Eastern Creek (JMCD CHM 2006a).

Salvage excavation of the northern side of Bungaribee Creek in 2011 by JMCD CHM recovered an very high density site with 5535 artefacts recovered from 41 one x one metre excavation units. Subsequent excavation in the areas surrounding Eastern Creek has included salvage excavation of AHIMS site # 45-5-3255 by Artefact in 2012 and test excavation of the area designated Bungaribee North by Artefact in 2015. Of particular interest is the variation seen between the JMCD CHM (2011) excavation and Bungaribee North. While the JMCD CHM (2011) excavation contained a significant proportion of silcrete tools within its artefact assemblage the Bungaribee North assemblage was composed completely of mudstone artefacts. The difference seen between the two sites despite similar landscape contexts hints at the high level of complexity of Bungaribee occupation patterns. Additional testing within the landform will enable further understanding of the variety of land use within the region

9.2.2 SZ PAD2

PAD2 is located on the crested area approximately 275 m east of the creek line. The crest represents a unique landform within the Bungaribee district that has not been previously investigated.

Previous archaeological salvage in the area has focused on the area surrounding both Eastern Creek and Bungaribee Creek. Landscapes investigated have been limited to flood plains, valley flats and lower slope terrain surrounding the creeks. The salvage excavation completed by Artefact in 2015 focused on two different landscape contexts, the valley flat and lower slope areas of the precinct. Excavation revealed that the landform contexts were associated with two distinct types of archaeological sites which exhibit different types of stone artefact reduction techniques and subsequently are representative of varied behaviour patterns. This study highlighted the value in considering varied landform types when developing an understanding of regional land use patterns

Sensitivity mapping completed by both JMCD CHM (2006b) and later modified by Artefact (2014a) indicate that the crest area represents an area of moderate archaeological potential. Given this and the untested nature of the crest landform this PAD contains significant research potential.

Figure 9: Location of SZ PAD1 and SZ PAD2

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Figure 10: Location of SZ PAD1 and SZ PAD2 overlaid onto the propose layout of Sydney Zoo

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10.0 ANALYSIS AND DISCUSSION

10.1 Results Discussion

No new Aboriginal sites were identified during site survey.

Two areas of PAD were recorded during the survey, including SZ PAD1 and SZ PAD2.

Three previously recorded Aboriginal sites within the study area were revisited during the survey. However, Aboriginal objects were not observed at each location primarily due to dense grass cover (AHIMS sites 45-5-4433 and 45-5-0465) and frequent grading and introduction of materials across the access road (AHIMS site 45-5-0455).

Vegetation within the study area comprised largely of dense grass cover, with the exceptions being extensive revegetation along the Eastern Creek corridor (Survey Unit 3) and open woodland in the northeastern portion of the study area.

Recent disturbance within the study area was generally isolated to specific areas of the site in particular disturbance related to the installation of the underground pipeline through the western portion of the study area, vehicle tracks and modified drainage channels. Large contour drainage banks were observed across part of the crest adjacent to the existing vehicle track. Other general surface disturbance across the study area includes original vegetation clearance following British occupation of the area, and works associated with the Overseas Transmission Centre such as concrete tower pads.

10.2 Analysis of Archaeological Potential

Previous archaeological investigations within Bungarribee Precinct have identified large areas of archaeological potential. This includes the identification of PAD WSP1 by JMcD CHM (2006b) and the refinement of that area of archaeological potential by Artefact Heritage (2015), called WS PAD1. WS PAD1 includes large portions of the current study area.

The boundaries of PAD WSP1 and subsequent recording as WS PAD1 were based on sample survey and desktop predictive modelling of Bungarribee Precinct. The boundaries of WS PAD1 were also delineated prior to recent archaeological salvage excavation adjacent to Eastern and Bungarribee Creeks by Artefact (2015). More detailed archaeological survey, such as within the Sydney Zoo portion of Bungarribee Precinct, provides more detailed and refined information on the extent of PAD in those areas.

Archaeological survey has refined the areas of PAD within the current study area to SZ PAD1 and SZ PAD2. SZ PAD1 incorporates the Eastern Creek floodplain area adjacent to a gentle slope landform. Although the Eastern Creek floodplain area is likely to be subject to occasional high intensity flooding, archaeological salvage excavation has previously identified moderate density deposits of Aboriginal artefacts demonstrating evidence of stone reduction activities (Artefact 2015).

The archaeological potential of SZ PAD1 has been extrapolated from salvage excavation at Bungarribee North by Artefact Heritage (2015) due to the fact that both are located across the same Eastern Creek floodplain landform within Bungarribee Precinct.

SZ PAD2 is situated across a prominent crest landform within the study area. The crest landform is unique within Bungarribee Precinct, and is the most prominent high point overlooking Eastern Creek in the local area. The archaeological potential of crest landforms has not been assessed through archaeological excavation within Bungarribee Precinct. Previous archaeological excavations within

Bungaribee Precinct have included a raised area overlooking Bungaribee Creek (JMcD CHM 2011), the eastern margin of the Eastern Creek floodplain (Artefact 2014b), the Eastern Creek floodplain (Artefact 2015) and a raised area and floodplain associated with a tributary of Bungaribee Creek (Artefact 2015).

11.0 STATUTORY REQUIREMENTS

This study has been undertaken in the context of several pieces of legislation that relate to Aboriginal heritage and its protection in New South Wales.

National Parks and Wildlife Act (1974) (NPW Act)

The NPW Act, administered by the OEH provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under Section 90 of the Act, and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community) under Section 84.

The protection provided to Aboriginal objects applies irrespective of the level of their significance or issues of land tenure. However, areas are only gazetted as Aboriginal Places if the Minister is satisfied that sufficient evidence exists to demonstrate that the location was and/or is, of special significance to Aboriginal culture.

The NPW Act was amended in 2010 and as a result the legislative structure for seeking permission to impact on heritage items has changed. A Section 90 permit is now the only Aboriginal Heritage Impact Permit (AHIP) available and is granted by the OEH. Various factors are considered by OEH in the AHIP application process, such as site significance, Aboriginal consultation requirements, ESD principles, project justification and consideration of alternatives. The penalties and fines for damaging or defacing an Aboriginal object have also increased.

As part of the administration of Part 6 of the NPW Act OEH has developed regulatory guidelines on Aboriginal consultation, which are outlined in *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010). Guidelines have also been developed for the processes of due diligence - *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (2010), and for investigation of Aboriginal objects - *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) in accordance with the 2010 amendment to the NPW Act.

Aboriginal sites are located within the study area. An AHIP would be required prior to impacts to these sites occurring.

Environmental Planning & Assessment Act (1979)

The EP&A Act is administered by the Department of Planning and Infrastructure, and provides planning controls and requirements for environmental assessment in the development approval process. This Act has three main parts of direct relevance to Aboriginal cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment processes for local government (consent) authorities and Part 5 which relates to activity approvals by governing (determining) authorities.

The proposal will be assessed under Part 4, Division 4.1 of the EP&A Act, which establishes an assessment and approval regime for State Significant Development (SSD). Part 4, Division 4.1 applies to development that is declared to be SSD by a State Environmental Planning Policy (SEPP). Section 89J of the EP&A Act specifies that approvals or permits under section 90 of the NPW Act 1974 are not required for approved SSD projects.

Aboriginal Land Rights Act (1983)

The Aboriginal Land Rights Act 1983 is administered by the NSW Department of Human Services - Aboriginal Affairs. This Act established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the Act to; (a) take action to protect the culture and heritage

of Aboriginal persons in the council's area, subject to any other law, and (b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

Native Title Act (1994)

The Native Title Act 1994 was introduced to work in conjunction with the Commonwealth Native Title Act. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

12.0 SIGNIFICANCE ASSESSMENT

12.1 Assessment Criteria

Archaeological significance refers to the archaeological or scientific importance of a landscape or area. This is characterised by using archaeological criteria such as archaeological research potential, representativeness and rarity of the archaeological resource and potential for educational values. These are outlined below:

- Research potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity: is the subject area important in demonstrating a distinctive way of life, custom, process, land use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential: does the subject area contain teaching sites or sites that might have teaching potential?

The archaeological potential of each recorded Aboriginal site and the Precinct as a whole is closely related to significance values. Areas of moderate archaeological potential have research potential and the potential for Aboriginal objects that are representative of Cumberland Plain archaeology. Areas of moderate archaeological potential are less likely to contain Aboriginal objects with rarity values.

Areas of low archaeological potential have limited research potential and rarity values, and are likely to be in disturbed contexts not representative of intact areas on the Cumberland Plain. All recorded Aboriginal sites and areas of archaeological potential within the Precinct have education potential.

Areas of low archaeological potential have limited research potential and rarity values, and are likely to be in disturbed contexts not representative of intact areas on the Cumberland Plain.

The distribution and nature of Aboriginal sites and associated heritage values provide important educational values for Aboriginal land-use on the Cumberland Plain. Higher educational values are associated with more intact areas on the Cumberland Plain such as Bungaribee Precinct considering the dense residential and commercial development in the region.

12.2 Archaeological Significance Assessment

The archaeological significance of identified Aboriginal sites within the study area is summarised in Table 3 below

Table 3: Archaeological Significance Assessment

Site Name	Research Potential	Scientific/ Archaeological Value	Representative Value	Rarity Value	Overall Significance
45-5-0455	Low	Low	Moderate	Low	Low
45-5-0465	Low	Low	Moderate	Low	Low
45-5-4433	Low	Low	Moderate	Low	Low
SZ PAD1*	Moderate	Moderate	Low/moderate	Low/moderate	Moderate
SZ PAD2	Unknown	Unknown	Unknown	Unknown	Unknown

* = likely significance based on the results of salvage excavation at Bungarribee North by Artefact (2015)

12.2.1 Sites of low archaeological significance

Sites listed as demonstrating low archaeological significance have been identified as impacted or associated with disturbance. AHIMS site 45-5-0459 is located in an area which has been heavily landscaped and modified as part of drainage, vegetation and pathway works. AHIMS site 45-5-3253 and 45-5-3255 are associated with disturbance and introduced gravels from construction of airstrips, taxiways and the OTC station. These sites do not represent research potential or archaeological value, and demonstrate low rarity and representative values in the local context.

12.2.2 SZ PAD1 – likely to demonstrate moderate archaeological significance

Results of archaeological excavation on the Eastern Creek floodplain at Bungarribee North by Artefact (2015) retrieved a moderate density sub-surface stone artefact scatter across a disturbed floodplain landform. The results of that excavation and identification of SZ PAD1 as an extension of that area of archaeological potential suggests that the assessed level of moderate research potential at Bungarribee North is likely to also be relevant to SZ PAD1.

SZ PAD1 is likely to have a moderate' archaeological significance based on the results of excavation at Bungarribee North. That assessment was based on the following factors:

- Although the raw materials are common to the region, stone artefact analysis has indicated a preference for mudstone in formal tool manufacture.
- Several formal tool types were identified within the assemblage and are indicative of a Bondaian assemblage associated with the ASTT (likely dating anywhere from 8,000 BP up until the contact period)
- At least one and potentially more knapping events are present within the area
- This type of site is less common within the Bungarribee Precinct.

Based on the results of salvage excavation, Bungaribee North was assessed as demonstrating moderate archaeological significance. The archaeological salvage has confirmed the research potential of the Eastern Creek floodplain and surrounding slope landform contexts. The site demonstrates low to moderate representative, rarity and education values.

12.2.3 Unknown archaeological significance – SZ PAD2

SZ PAD2 is considered to demonstrate unknown archaeological significance. This is due to the fact that the PAD is located within an area of limited surface visibility and therefore any artefacts that may be present on the surface were not detected during the survey. The PAD has been identified within an area of moderate archaeological potential associated with a crest landform context. Therefore there is a moderate potential that intact archaeological deposits and subsurface cultural material may be identified during excavations. Crest landforms have not been previously investigated within the Bungaribee precinct therefore the archaeological significance, extent and nature of SZ PAD2 cannot be accurately assessed until further archaeological investigations have been conducted.

12.3 Cultural Significance

Any comments received from Aboriginal stakeholders on the cultural significance of the study area would be attached with the final version of this report. The cultural significance of the study area will be addressed in the Aboriginal Cultural Heritage Assessment Report (ACHAR) prepared for the project prior to impacts.

13.0 IMPACT ASSESSMENT

It is assumed that the initial impacts associated within the proposal will be land clearance and ground disturbance works associated with the development of the following park features:

- Main car park (728 spaces) – Gravel surface, vehicle control
- Overflow car park (659 spaces) – Gravel surface, vehicle control
- Entry, administrative and exhibition facilities
- Moat water feature – Varying depth between 1.8-3m
- Varied animal enclosures including nocturnal house, aquarium and aviary.
- Service access roads.
- Amenities
- Holding paddocks
- Picnic areas

The levels of surface impact within the development area will be high and will impact any identified Aboriginal objects or areas of PAD in those areas.

13.1 Summary of Impacts

Based on the current masterplan, specific impacts to each site are outlined below:

- AHIMS Site # 45-5-0465 will be impacted by car park works including associated earth works and tree planting
- AHIMS Site # 45-5-0455 will be impacted by the dingo enclosure
- AHIMS Site #45-5-4433 will be impacted by the African grassland exhibit
- Impacts to 0.4 hectares of SZ PAD1 from extension of the car park into that area as well as a portion of access road around the western perimeter of the zoo exhibits
- SZ PAD 2 will be impacted by a variety of exhibits including the Tiger, Elephant and Baboon exhibits as well as the back of house building development associated with these areas.

Table 4: Summary of impacts to identified Aboriginal objects and areas of PAD

Site Number	Type of Harm	Degree of Harm	Consequence of Harm
45-5-0455	Direct	Total	Total loss of value
45-5-0465	Direct	Total	Total loss of value
45-5-4433	Direct	Total	Total loss of value
SZ PAD1	Direct	Partial	Partial loss of value
SZ PAD2	Direct	Total	Total loss of value

14.0 MANAGEMENT AND MITIGATION MEASURES

14.1 Guiding Principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved. If conservation is not practical, measures should be taken to mitigate impacts to Aboriginal sites.

The nature of mitigation measures is primarily based on an assessment of archaeological significance. As the archaeological significance of Aboriginal sites within the Precinct could not be accurately determined, and the Masterplan impacts at this stage are indicative, a framework of mitigation and management measures based on archaeological potential has been established, and is outlined below.

14.2 Mitigation Measures

The mitigation measures recommended vary depending on the assessment of archaeological significance of the Aboriginal site which is based on its research potential, rarity, representativeness and educational value. In general the significance of a site would involve the following mitigation measures:

- Low archaeological significance – Conservation where possible. An AHIP would be required to impact the site before works can commence.
- Moderate archaeological significance – Conservation where possible. If conservation was not practicable further archaeological investigation would be required such as salvage excavations or surface collection under an AHIP.
- High archaeological significance – Conservation as a priority. An AHIP would be required only if other practical alternatives have been discounted. Conditions of this AHIP would depend on the nature of the site, but may include removal and preservation of scarred trees, or comprehensive salvage excavations.
- Unknown archaeological significance – Conservation where possible. Further investigation under the OEH Code of Practice (2010) will be required to assess the extent and significance of the PAD. Test excavation is not a mitigation measure.

Table 5 provides a summary of the consequence of impacts and indicative management and mitigation measures. This information would be updated once the progressed concept design has been integrated into this report and the impact assessment revised.

Table 5: Summary of impacts and mitigation/management measures

Site ID	Site names	Site type	Significance	Consequence of Impact	Mitigation/management measures
45-5-0455	Bungarribee 10 Blacktown	Artefact Scatter	Moderate	Total loss of value	None required

Site ID	Site names	Site type	Significance	Consequence of impact	Mitigation/management measures
45-5-0465	Bungarribee 18 Blacktown	Artefact Scatter	Low	Total loss of value	None required
45-5-4433	BP AS6	Artefact Scatter	Moderate	Total loss of value	None required
-	SZ PAD1	PAD	Moderate (likely level of archaeological significance)	Possible partial loss of value	Mitigation measures to be determined in ACHAR following finalisation of impacts
-	SZ PAD2	PAD	Unknown	Total loss of value	Further investigation in accordance with OEH code of practice required

14.2.1 AHIMS Sites 45-5-0455, 45-5-0465 and 45-5-4433

AHIMS sites 45-5-0455, 45-5-0465 and 45-5-4433 have been assessed as demonstrating low archaeological significance and low research potential. No further archaeological investigation of the three recorded Aboriginal sites is recommended.

14.2.2 SZ PAD1

SZ PAD1 has been assessed as likely to demonstrate moderate archaeological significance based on the results of archaeological salvage excavation at Bungarribee North by Artefact (2015). As such, archaeological test excavation in accordance with the OEH code of practice to determine the archaeological significance of SZ PAD1 is not recommended.

The current layout plan for Sydney Zoo includes extension of the car park to cover approximately 0.4 hectares of SZ PAD1. A final impact assessment will be incorporated into the ACHAR prior to works commencing. The ACHAR will outline the exact extent of impact and what, if any, archaeological mitigation measures will be required prior to impacts. Potential archaeological mitigation measures includes archaeological salvage excavation within that portion of SZ PAD1 that will be impacted by the works.

14.2.3 SZ PAD2

SZ PAD2 will be directly impacted by the proposal, resulting in total loss of value.

The archaeological significance of SZ PAD2 is at present unknown. The PAD has been assessed as having moderate archaeological potential. If impacts to the PAD cannot be avoided by the proposal, test excavation in accordance with the OEH code of practice is recommended in order to determine whether sub-surface intact archaeological deposits and Aboriginal objects are present in that area. The purpose of these excavations would be to assess the nature and significance of potential sub-surface archaeology at SZ PAD2 and not to mitigate against impacts.

14.3 Management Strategies

A comprehensive discussion of management strategies and processes would be prepared as part of the ACHAR in consultation with registered Aboriginal stakeholders. This discussion would outline procedures for management of unexpected archaeological finds, including human remains, along with processes to manage changes in proposed impacts.

15.0 CONCLUSIONS AND RECOMMENDATIONS

The following recommendations were based on consideration of:

- Statutory requirements under the EP&A Act 1979.
- The requirements of the SEARs.
- The results of the background research, site survey and assessment.
- The likely impacts of the proposed development.
- The interests of DLALC.

The findings of the ASR are:

- Three previously recorded Aboriginal sites are located within the study area (AHIMS sites # 45-5-0455, #45-5-0465 and # 45-5-4433). These sites were assessed as demonstrating low archaeological significance.
- Two areas of Potential Archaeological Deposit (PAD) were identified during the study (SZ PAD1 and SZ PAD2).
- Disturbance was generally assessed to be low with the exception of the modified drainage channel and pipeline located in eastern and western portion of the study area respectively.

It is therefore recommended that:

- No further archaeological investigation of AHIMS sites 45-5-0455, 45-5-0465 and 45-5-4433 is recommended.
- As the likely archaeological significance of SZ PAD1 has been determined based on archaeological salvage excavation in a comparable landform at Bungarribee North, archaeological test excavation in that portion of SZ PAD1 that will be impacted is not required.
- Archaeological test excavation in accordance with the OEH code of practice as best practice is recommended at SZ PAD2 to determine the extent and archaeological significance of PAD in that area.
- Following completion of archaeological test excavation at SZ PAD2, a report would be prepared that outlines the findings of the investigation and assesses the archaeological significance of the PAD.
- Following the completion of archaeological test excavation and reporting at SZ PAD2, an Aboriginal Cultural Heritage Assessment Report (ACHAR) would be prepared for the study area that includes the results of consultation with registered Aboriginal stakeholders, an assessment of cultural significance, a final impact assessment and management measures for the proposal.
- The ACHAR would include an outline of what mitigation and management measures would be required within that portion of SZ PAD1 impacted by the extension of the car park into that area.
- If changes are made to the proposed works which may impact any area not investigated in this ASR, further archaeological investigation may be required.

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17.0 APPENDICES

17.1 Appendix A Comments received from DLALC

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artefact

Artefact Heritage

ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia

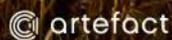
+61 2 9518 8411
office@artefact.net.au
www.artefact.net.au

Appendix E: Archaeological Test Excavation Report

Sydney Zoo, Bungarribee Precinct

Archaeological Test Excavation
Report

Report to Sydney Zoo
JUNE 2016



Artefact Heritage
ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au

EXECUTIVE SUMMARY

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

NSW Department of Planning and Environment (DPE) has declared the project a State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

In accordance with the SEARs, Artefact Heritage was engaged by Sydney Zoo to conduct an Aboriginal heritage assessment of the proposal site (herein the study area). That assessment was prepared in 2015 and identified the location of three previously recorded Aboriginal sites located within the study area and two areas of potential archaeological deposit (PAD). The three previously recorded sites were considered to be of low archaeological significance and no further archaeological investigation was recommended. Based on previous subsurface archaeological investigations within the Bungarribee Precinct salvage excavation was recommended where there would be significant impacts to SZ PAD01. Archaeological test excavation in accordance with the OEH 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010) (herein the OEH Code of Practice) was recommended for SZ PAD02.

Following the preparation of a test excavation methodology (Artefact Heritage 2016) and consultation with registered Aboriginal stakeholders, a test excavation program was conducted within SZ PAD02 over four days between 26 April and 29 April 2016. Further details of Aboriginal stakeholder consultation and participation in the test excavation program is outlined in Sections 3.0 and 7.2 of this report. This Archaeological Test Excavation Report (ATER) outlines the results of archaeological test excavation at SZ PAD02.

Overview of findings

- The test excavation program identified two dispersed artefact scatters at SZ PAD02. These artefact scatters have been designated the site names SZ AS01 and SZ AS02.
- Stone artefact scatters are considered to be common within the Cumberland plan.
- Sites SZ AS01 and SZ AS02 have both been assessed to be of low archaeological significance.

Recommendations

- Aboriginal sites SZ AS01 and SZ AS02 have been assessed to be of low archaeological significance. No further archaeological investigation is recommended for either of these sites.
- Long term care of excavated artefacts, such as reburial would be undertaken in accordance with the OEH Code of Practice (2010) and the recommendations of registered Aboriginal stakeholders.
- Site recording forms would be submitted to AHIMS for SZ AS01 and SZ AS02.

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

Sydney Zoo is seeking approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction of a zoo (Sydney Zoo) within the Bungarribee Precinct in the Western Sydney Parklands.

NSW Department of Planning and Environment (DPE) has declared the project a State Significant Development (SSD). Assessment and approval is being pursued in accordance with the EP&A Act. The Secretary's Environmental Assessment Requirements (SEARs) for the project have been issued and set out the environmental assessment requirements for the project.

In accordance with the SEARs, Artefact Heritage was engaged by Sydney Zoo to conduct an Aboriginal heritage assessment of the proposal site (herein the study area). That assessment was prepared in 2015 and identified the location of three previously recorded Aboriginal sites located within the study area and two areas of potential archaeological deposit (PAD). The three previously recorded sites were considered to be of low archaeological significance and no further archaeological investigation was recommended. Based on previous subsurface archaeological investigations within the Bungarribee Precinct salvage excavation was recommended where there would be significant impacts to SZ PAD01. Archaeological test excavation in accordance with the OEH 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010) (herein the OEH Code of Practice) was recommended for SZ PAD02.

Following the preparation of a test excavation methodology (Artefact Heritage 2016) and consultation with registered Aboriginal stakeholders, a test excavation program was conducted within SZ PAD02 over four days between 26 April and 29 April 2016. Further details of Aboriginal stakeholder consultation and participation in the test excavation program is outlined in Sections 3.0 and 7.2 of this report. This Archaeological Test Excavation Report (ATER) outlines the results of archaeological test excavation at SZ PAD02.

1.2 Study Area

The study area is located in the southern portion of Lot 101/ DP1195067 within the Blacktown City Local Government Area (LGA). It is bounded by Eastern Creek to the west, Doonside Road to the east and the Great Western Highway to the south (Figure 1). The study area is 16.5 hectares.

1.3 The Proposal

The proposal includes the development of the land within the study area into a world class zoo exhibiting a wide range of popular animal species (Figure 2). The facility will provide an immersive safari-like experience including open grassland areas, elevated walkways and boardwalks, reptile and nocturnal animal houses, aquarium and infrastructure to service 30+ exhibits. Education and conservation programs planned for the Zoo are intended to provide a focus on local heritage values including natural and Aboriginal heritage.

The following description of the proposed works has been taken from Chapter 3.0 of the Environmental Impact Statement (EIS) (JBA 2015).

The proposed development of Sydney Zoo will include.

- Animal exhibits across several enclosures of varying design for a range of native and exotic animals.
- Back-of-house buildings for exhibits.
- Main entrance building comprising entry/exit, and gift shop.
- Restaurant and café.
- Kiosks and amenities.
- Show arena.
- Picnic areas and gardens.
- Wetlands and waterways.
- Service building containing:
 - Administration areas;
 - Curatorial and food preparation areas; and
 - Veterinarian space.
- Signage
- Service yard with maintenance shelter.
- Internal services and utilities to support the Zoo, including water, sewer, electricity and telecommunications
- Main car park for approximately 475 vehicles, with an overflow car park for approximately 840 vehicles (accessed via an internal road connecting to the Great Western Highway)
- Bus and coach parking.
- Subdivision; and
- Landscaping of the site associated with all of the above.

There will be some site preparation works required prior to construction of the Zoo. These will include bulk earthworks to provide minor regrading of the site for development purposes, along with exhibit wall mounds and moats. All soil excavated on-site will be reused on-site to avoid the need for off-site removal of soil.

The earthworks will not fundamentally change the topography of the site but are intended to fine-tune levels to support the landscape outcomes. Approximately 13 600m³ of clean fill will be brought to the site to support landscaping. Fill will be virgin excavated natural material (VENM) or excavated natural material (ENM).

Construction of the project is expected to take approximately 8 – 12 months to complete.

1.4 Authorship

This report was prepared by Claire Rayner (Heritage Consultant). Management input and review was provided by Josh Symons (Principal Consultant).

1.5 Scope of this report

This report discusses the archaeological test excavation of SZ PAD02 only. Details of the nature and mitigation measures for other recorded Aboriginal sites and SZ PAD01 identified within the study area during the ASR are provided in the associated Aboriginal Cultural Heritage Assessment Report (ACHAR).

Figure 1: Location of the study area

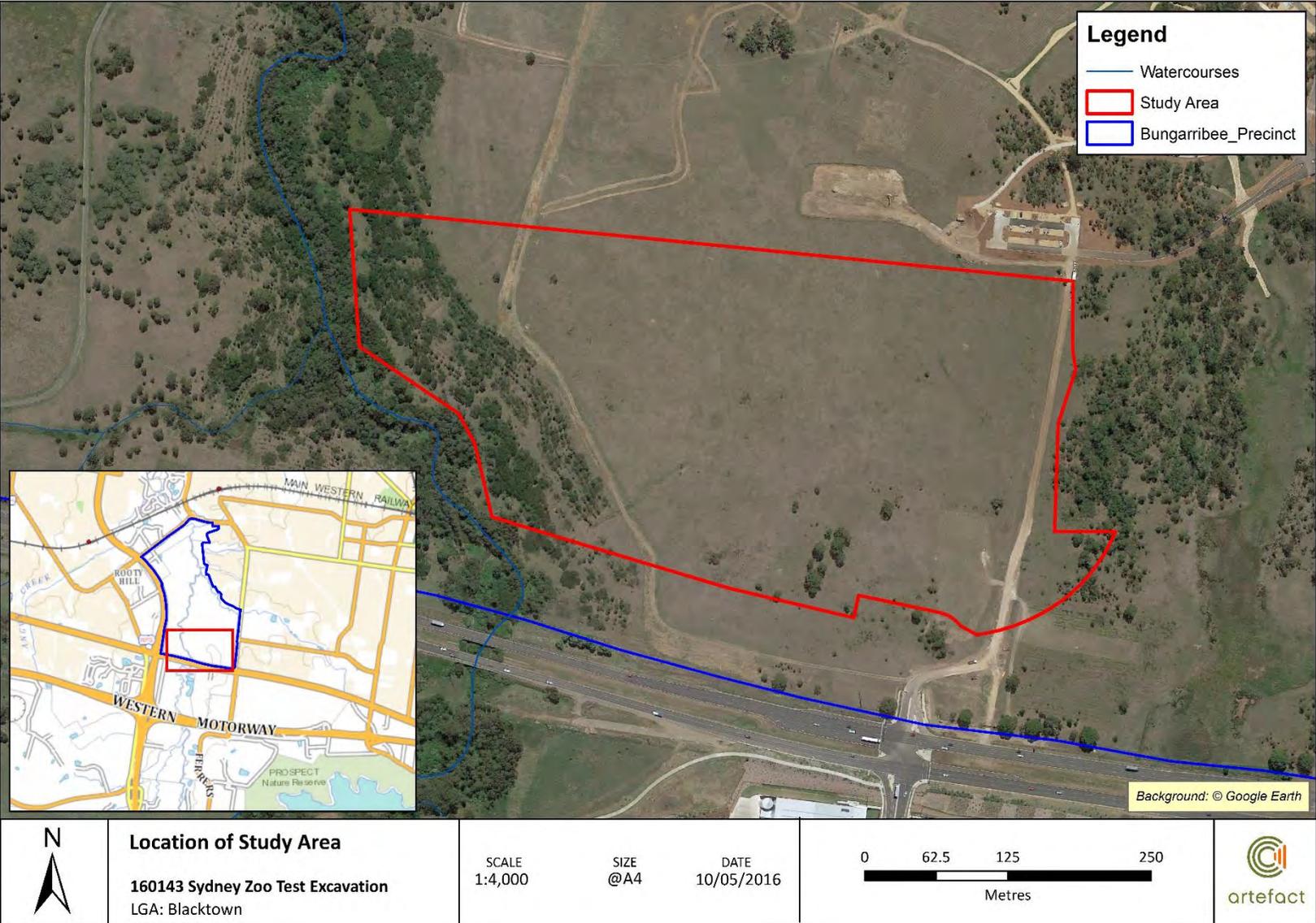


Figure 2: The proposed masterplan for the Sydney Zoo, Bungarribee (provided by JBA)

- KEY**
1. Entrance building
 2. Nocturnal Aviary
 3. Reptile Enclosure
 4. Aquarium
 5. Petting Zoo
 6. Picnic and Play Area
 7. The Boulevard
 8. Main pedestrian path
 9. Lunching with the Lions
 10. Kiosk
 11. Elevated Boardwalk
 12. Water Storage Basin
 13. Administration and Sanitation Building
 14. Service Yards
 15. Penwater Service Road
 16. Main Car Park
 17. Overflow Car Park
 18. Back of House Buildings
 19. Site Pond
 20. Restaurant/Cafe
 21. Back of House service Road
 22. Exhibit Water Moat
 23. Exhibit Dry Moat
 24. Show Arena
 25. Loading Poddock
- AFRICAN GRASSLANDS**
26.
- SOUTH EASTERN TROPICAL**
27.
- AFRICAN HIGHLANDS**
28.
- CUMBERLAND PLIN WOODLANDS**
29.



Sydney ZOO DA
ASPECT Studios™

Client: Sydney Zoo



Drawn: BK
Checked: KL

Scale: 1:1000 @ A1
Date: March 2016



Drawn to: L03
Rev: A

Landscape Plan

2.0 LEGISLATIVE CONTEXT

This ATER has been undertaken within the context of several items of legislation that relate to Aboriginal heritage and its protection in New South Wales.

The *National Parks and Wildlife Act 1974* (NPW Act), administered by Office of Environment and Heritage (OEH), provides statutory protection to all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under section 90. The NPW Act was amended in 2010, and as a result the legislative structure for seeking permission to impact on heritage items has changed. A section 90 permit is now the only Aboriginal Heritage Impact Permit (AHIP) available and may only be granted by OEH if the conditions of the 'due diligence guidelines', and / or an 'archaeological investigation' have been met.

As part of the administration of Part 6 of the NPW Act, the OEH has developed regulatory guidelines on Aboriginal consultation, which are outlined in the *Aboriginal cultural heritage consultation requirements for proponents 2010*. In accordance with the 2010 amendment to the NPW Act guidelines have also been developed for the processes of due diligence– *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (herein referred to as the Due Diligence Code of Practice), and for investigation of Aboriginal objects– *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (herein referred to as the Code of Practice)

As the proposal will be assessed as a State Significant Development (SSD) under Part 4, Division 4.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act) approvals or permits under section 90 of the NPW Act 1974 are not required. However, the OEH guidelines have been followed for this assessment to ensure best practice.

The EP&A Act is administered by the Department of Planning and Infrastructure, and provides planning controls and requirements for environmental assessment in the development approval process. This Act has three main parts of direct relevance to Aboriginal cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment processes for local government (consent) authorities and Part 5 which relates to activity approvals by governing (determining) authorities.

The proposal will be assessed under Part 4, Division 4.1 of the EP&A Act, which establishes an assessment and approval regime for State Significant Development (SSD). Part 4, Division 4.1 applies to development that is declared to be SSD by a State Environmental Planning Policy (SEPP). Section 89J of the EP&A Act specifies that approvals or permits under section 90 of the NPW Act 1974 are not required for approved SSD projects.

The *Aboriginal Land Rights Act 1983* is administered by the NSW Department of Human Services - Aboriginal Affairs. This Act established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the Act to; (a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and (b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

The *Native Title Act 1994* was introduced to work in conjunction with the Commonwealth Native Title Act. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

2.1.1 Archaeological test excavation guidelines

Archaeological test excavation was conducted in accordance with the OEH Code of Practice. The Code of Practice prescribes guidelines for archaeological test excavation without an AHIP, and the way in which they are excavated.

3.0 ABORIGINAL CONSULTATION

Aboriginal community consultation has been guided by OEH *Aboriginal cultural heritage consultation requirements for proponents 2010*. A consultation log has been maintained which details all correspondence with registered Aboriginal stakeholders.

In accordance with step 4.1.2 of the Consultation Requirements, Artefact Heritage corresponded with the following organisations by letter requesting the details of Aboriginal people who may hold cultural knowledge relevant to determining the Aboriginal significance of Aboriginal objects and/or places within the Bungarribee Precinct:

- Aboriginal heritage department of the Metropolitan OEH
- Deerubbin Local Aboriginal Land Council (DLALC)
- The Registrar, *Aboriginal Land Rights Act 1983*
- National Native Title Tribunal
- NTSCORP
- Blacktown City Council
- Greater Sydney Catchment Management Authority

In accordance with Step 4.1.3 of the consultation requirements, an advertisement was placed in the Blacktown Sun on 30 June 2015. The advertisement invited all Aboriginal persons and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places in the subject land to register their interest by 5 August 2015.

In accordance with Step 4.1.3 of the consultation requirements, letters were sent to all Aboriginal persons or organisations identified through responses from agencies contacted as part of Step 4.1.2. The letters provided details about the location and nature of the proposal, as well as an invitation to register as an Aboriginal stakeholder.

Following the completion of steps 4.1.2 and 4.1.3 forty-five Aboriginal stakeholders registered as persons or organisations that may hold cultural knowledge relevant to determining the Aboriginal cultural values of the study area. The registered Aboriginal stakeholders are summarised in Table 1 below.

Table 1: Registered Aboriginal stakeholders

[REDACTED]	[REDACTED]

4.0 BACKGROUND CONTEXT

A summary of background information is included below. Comprehensive background information can be found in the ASR (Artefact Heritage 2015).

4.1 Environmental Context

The study area is located on the Cumberland Plain, which would once have been covered by open Cumberland Plain Woodland, which is typical of the Wianamatta Group shale geology. Tree species would have included Forest Red Gum (*E. tereticornis*), and Grey Box (*E. moluccana*) (Benson and Howell 1990). The original vegetation within the study area has mostly been cleared. The study area is located across slope and flat landforms bordering Eastern Creek. The southern half of the study area is located across slopes associated with undulating terrain in the southeastern corner of Bungarribee Precinct.

The primary soil type across the area is the Blacktown soil landscape, which generally consists of shallow duplex soils over a clay base. Overlying fluvial soils were associated with the alluvium across the low-lying terrain bordering Eastern Creek. The fluvial soils, called the South Creek soil landscape, are likely to be subject to frequent flood events. Eastern Creek is a major watercourse across the Cumberland Plain that flows north into South Creek in the Marsden Park area. Bungarribee Creek, to the north of the study area, is a second order watercourse that flows northwest from the Prospect area into Eastern Creek.

4.2 Aboriginal History of the Locality

Prior to the appropriation of their land by Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. It seems that territorial boundaries were fairly fluid, although details are not known. The language group spoken on the Cumberland Plain is known as Darug (Dharruk – alternative spelling).

This term was used for the first time in 1900 (Matthews and Everitt) as before the late 1800s language groups or dialects were not discussed in the literature (Attenbrow 2010:31). The Darug language group is thought to have extended from Appin in the south to the Hawkesbury River, west of the Georges River, Parramatta, the Lane Cove River and to Berowra Creek (Attenbrow 2010:34). This area was home to a number of different clan groups throughout the Cumberland Plain.

British colonisation had a profound and devastating effect on the Aboriginal population of the Sydney region, including Darug speakers. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources. Overall the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic over half of the Aboriginal people of the Sydney region died. The disease spread west to the Darug of the Cumberland Plain and north to the Hawkesbury. It may have in fact spread much further afield, over the Blue Mountains (Butlin 1983). This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them, or record their clan names (Karskens 2010:425).

The government policy of removal of Aboriginal children from their parents in order to assimilate them into white society began fairly early on in the colony's history, and was epitomized by the development of the Native Institution at Parramatta in 1814. This facility was moved to the Black

Town settlement in 1823 approximately six kilometres north-west of the current study area. It was closed in 1829 and the land was used for farming, but the site remains significant for its historical, archaeological and social values (GML 2010:36).

Into the nineteenth and twentieth centuries descendants of Darug language speakers continued to live in Western Sydney along with Aboriginal people from other areas of NSW. The Aboriginal groups in their comments on this study will address the contemporary cultural, social and spiritual meanings of the locality.

4.3 Archaeological Context

The study area is located within a region that has been subject to frequent archaeological investigations. Early investigations within the Blacktown area conducted by Jim Kohen identified 25 major sites within the Blacktown LGA consisting of 50 or more stone artefacts (Kohen 1986). This early study identified silcrete as the predominant raw material for the area. Other raw materials present within the assemblages include chert, quartz, silicified wood, basalt and quartzite. The sites were generally associated with reliable water sources including Eastern Creek. Work carried out by Brown in 2008 also identified archaeological potential associated with the Eastern Creek corridor.

Archaeological investigation of Plumpton Ridge, bordering the western side of Eastern Creek approximately six kilometres northwest of the study area, identified a significant silcrete extraction site and tool manufacturing area (JMcD CHM 2006a). The comprehensive archaeological investigation on the eastern side of Plumpton Ridge involved the excavation of 687 square metres across seven locations. These locations were representative of different landscape units within the study area and included floodplain, upper and mid slope and one site on a terrace/bank of Eastern Creek. The later site produced the highest density of artefacts, up to 1,289 per square metre. The excavation results indicated that the Plumpton Ridge quarry site was used extensively by Aboriginal people, though probably with greatest intensity over the last few thousand years (JMcD CHM 2006a: 136).

4.3.1 Previous archaeological investigations within the Bungarribee Precinct

A number of archaeological investigations have been conducted within the Bungarribee Precinct, including surveys by Jim Kohen as part of his PhD research in 1984 and as part of an investigation for Blacktown City Council in 1986, and more recent investigations by JMcD CHM (2006b; 2007; 2011). Several smaller investigations have also been undertaken within the Precinct and wider Parklands area as impact assessment studies and archaeological management studies (Haglund 1987; 2000; Navin Officer 1993; AMBS 2005; Artefact Heritage 2012).

JMcD CHM (2006-2011)

JMcD CHM's archaeological investigations into the Bungarribee Precinct included an initial survey and archaeological assessment (2006b), an Indigenous Heritage Impact Statement (2007), and archaeological excavation of a portion of potential archaeological deposit (PAD) identified in the earlier assessment (2011).

The initial survey and impact statement (2006b and 2007) identified that 52 recorded Aboriginal sites and five PADs were located across the Bungarribee Precinct. During that investigation the Precinct covered a much larger area than the current boundaries, and included both the Bunya residential area (previously referred to as the Doonside residential parcel) to the northeast, and the Bungarribee industrial estate area to the south of the Great Western Highway (previously referred to as the Huntingwood West Employment Lands).

JMcD CHM (2007) developed a Strategic Management Model (SMM) for the Precinct, which identified sites and sensitive landscapes within the Precinct. A significant portion of the Precinct was designated Zone 1 (good archaeological potential) and delineated as PAD WSP1 (see Figure 5). JMcD CHM recommended that Zone 1 areas were avoided and that a possible Aboriginal heritage conservation area declared. Other areas within the Precinct were assessed as Zone 3 (low archaeological potential). JMcD CHM recommended that there were no heritage constraints to development in those areas and no further archaeological works required. It is noted however, that Aboriginal stakeholders may want to monitor development within these areas, particularly along the creek lines.

Salvage excavation was recommended for portions of identified good and moderate archaeological potential that would be impacted by proposed development within Bungarribee Precinct (JMcD CHM 2007: 39).

Figure 3: Location of PAD WSP1 within Bungarribee Precinct, yellow indicates good potential, with areas assessed as demonstrating greatest potential marked by white stars (JMcD CHM 2006b: 9)

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Artefact Heritage (2014-2015)

In 2014 Artefact Heritage prepared an ASR for the entirety of the Bungarribee Precinct as part of Aboriginal heritage investigations for the Bungarribee Precinct Masterplan. As part of that investigation a number of previously recorded Aboriginal sites were revisited and several additional sites recorded.

The ASR discussed previously recorded Aboriginal sites within the Precinct, as well as additional sites identified during the preparation of that ASR. The outcome of the ASR was the refinement, of the boundaries of PAD WSP1 based on background research and sample archaeological survey (JMcD CHM 2006b). The refined extent of PAD WSP1, which was renamed “WS PAD1” for the purposes of that ASR, is shown in Figure 4.

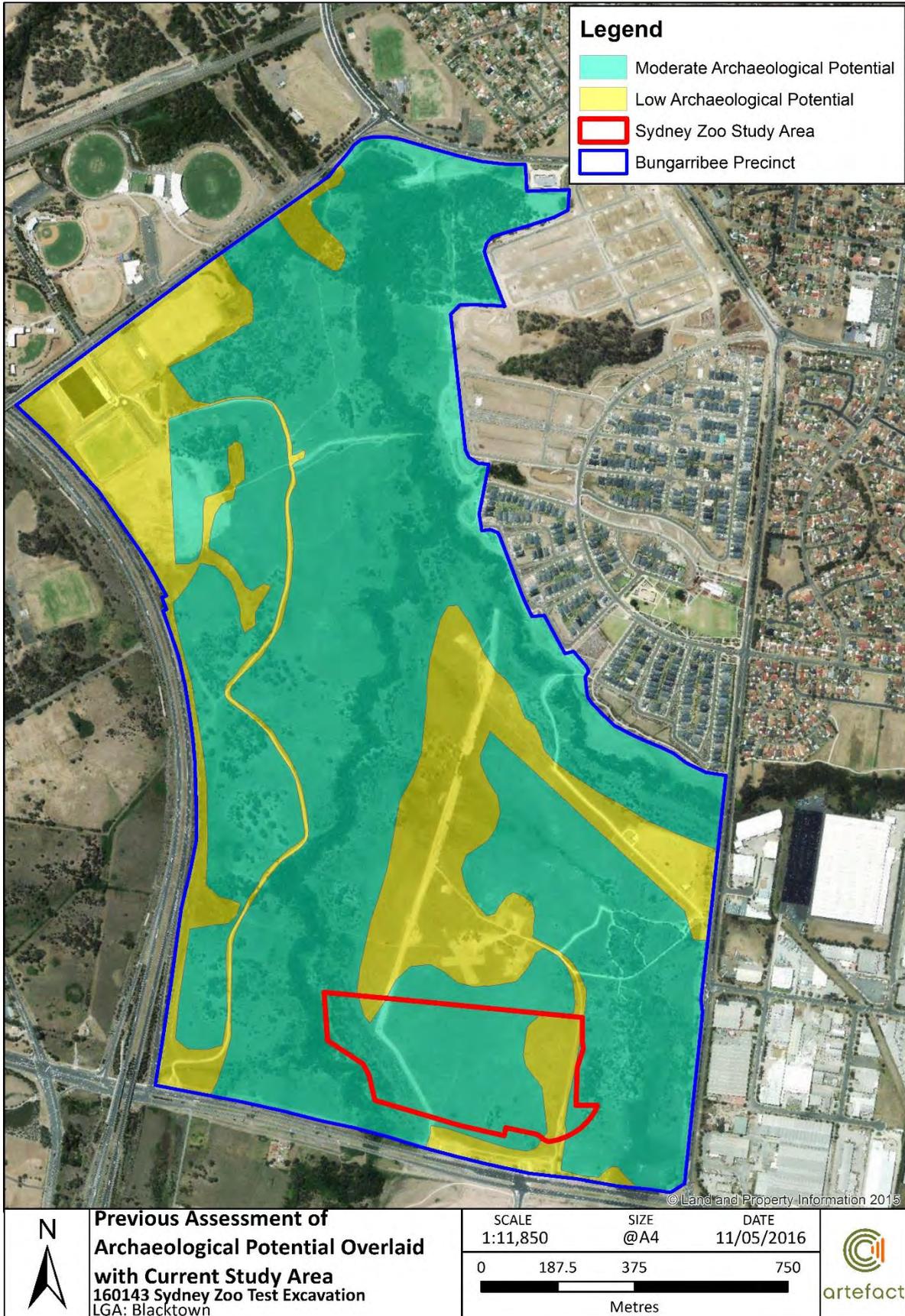
Artefact Heritage (2014) noted that no areas of high archaeological potential were identified within the Precinct. This was based on the results of subsurface investigation within the local area, including excavation at AHIMS site #45-5-2719 and #45-5-3255 within the Bungarribee Precinct, and at #45-5-3883 adjacent to the eastern margin of the Precinct (a further description of archaeological excavation at these three sites is included in Section 4.3.2).

The landform context of AHIMS site #45-5-3883, which included a slope context in close proximity to Bungarribee Creek and the confluence of that creek with Eastern Creek, demonstrated a very high-density artefact scatter. In contrast, excavation at AHIMS sites #45-5-3255 and #45-5-2719 further from Eastern Creek demonstrated much lower density artefact scatters. With localised exceptions the remainder of the Precinct was characterised by low-lying and gently undulating landform contexts bordering Eastern Creek and Bungarribee Creek.

Artefact Heritage (2015) identified the broad central portion of Bungarribee Precinct associated with Eastern Creek and Bungarribee Creek as demonstrating moderate archaeological potential (see Figure 4). It is likely that the density of potential subsurface archaeological deposit in this zone would vary, with large areas of low density archaeological deposit interspersed with areas of higher density deposits.

The majority of the current study area was assessed to have moderate archaeological potential during the Bungarribee Precinct Masterplan investigations.

Figure 4: Reassessment of archaeological potential within the Bungarribee Precinct, the current study area is outlined in red



4.3.2 Previous archaeological excavations within Bungarribee Precinct

Mills and Kelton (2002)

In 2002 Mills and Kelton undertook subsurface investigations at AHIMS site 45-5-2719 prior to the construction of the M7. A series of 328 augers, were opened up approximately 1 km northwest of the study area along the western boundary of the Eastern Creek floodplain, and including low-lying elevated land bordering the floodplain. Although the surface of the site included areas that appeared quite disturbed, test excavation retrieved a total of 83 artefacts from a relatively intact deposit.

JMcD CHM 2011 – Western Sydney Parklands: Bungarribee Precinct Project, Precinct 2 S87 Excavation Report

A portion of WSPAD1 within the Bunya residential area, 30 m north of Bungarribee Creek, was excavated as part of impact mitigation prior to development of that area (JMcD CHM 2011). The portion of excavated PAD is recorded on the AHIMS sites register with the site name WSP PAD AHIMS #45-5-3883. The site is located approximately 1.2 km north of SZ PAD02.

The excavations targeted the lower slope landform associated with the confluence of Eastern Creek and Bungarribee Creek. A dense assemblage of 5, 535 artefacts from 41 one metre square pits and 82 square metres of open area. The distribution of artefacts was found to be relatively even across the site with artefacts retrieved from all test units. The open area excavations targeted the higher flat ground of the testing area.

The excavations also retrieved a total of 1, 083 cultural pieces of silcrete and silicified tuff crenate affected by heat shatter, and 11,751 pieces of silcrete gravel. The high frequency of silcrete gravel was considered to indicate a minor silcrete raw material source at the site or nearby.

The majority of the lithic items recovered were silcrete followed by silicified tuff. A small proportion of quartz, silicified wood, quartzite and unidentifiable raw materials were also recovered. The assemblage contained cores, flakes, flake fragments and flaked pieces as well as retouched artefacts and backed artefacts. Reduction technologies such as bipolar knapping were observed within the assemblage.

The high proportion of silcrete within the assemblage as well as the high proportion of flake fragments and flaked pieces was considered to be related to the early stage knapping of locally available silcrete. The site was interpreted as representing multiple periods of occupation.

The site was considered to be of moderate to high archaeological significance.

Artefact Heritage 2014b – Bungarribee Wastewater Trunk Pipeline WSP Archaeological Salvage Excavation Report

In 2012, Artefact Heritage conducted a survey of a proposed wastewater trunk pipeline through the Bungarribee Precinct. Artefacts associated with three previously recorded Aboriginal sites (AHIMS #45-5-3253, #45-5-3255 and #45-5-3256) were identified within the assessment area. AHIMS #45-5-3255 and #45-5-3256 were assessed as demonstrating moderate archaeological significance with potential to provide information about Aboriginal occupation of the area. It was also determined that further investigation of these sites would enable comparisons to be made between past Aboriginal occupation within the Bungarribee Precinct and the local area. The salvage excavation covered the lower slope and terrace landform bordering the eastern side of the Eastern Creek floodplain.

AHIMS #45-5-3253 was assessed as demonstrating low archaeological significance due to the site being situated within a disturbed context. To mitigate impacts to Aboriginal cultural heritage by the

proposed works, surface collection of visible artefacts at AHIMS #45-5-3255 and #45-5-3256 was recommended. Salvage excavation was also recommended for AHIMS #45-5-3255.

Site #45-5-3255 was located on a low terrace landform. A total of 73 artefacts were retrieved from 35 salvage 1m by 1m units. The excavated artefact assemblage was primarily comprised of silcrete. Other raw materials present included mudstone, quartz, chert and fine grained siliceous. The assemblage was dominated by flakes and flake fragments with no formal tools identified.

The excavations identified a much lower density artefact scatter than that identified at site #45-5-3883 located on a lower hill slope associated with the confluence of Bungarribee and Eastern Creeks. This difference in densities indicates a trend in land-use patterns by Aboriginal people in the past. It appears that the lower hill slope landform of #45-5-3883 was occupied more intensely and over multiple time periods. Whilst the low terrace landform of #45-5-3255 was occupied less intensively and intermittently.

The surface collection conducted at AHIMS site #45-5-3253 did not recover any artefacts. There were 17 artefacts retrieved during the surface collection across site #45-5-3256. At the time that report was prepared, site boundary of AHIMS site 45-5-3256 was extended south to the Great Western Highway, including portions of the current study area. All artefacts identified on the ground surface associated with that extended site area were collected/ impacted under AHIP 1132317.

Further investigations within the Bungarribee Precinct and consideration of sub-surface artefact densities has led to a reappraisal of the site area of 45-5-3256, and refinement of its location to an area north of the current study area. Any surface artefacts associated with the former southern extent of 45-5-3256 that overlap with the Sydney Zoo site were impacted in accordance with AHIP 1132317.

Artefact Heritage 2015 – Bungarribee Precinct Masterplan Stages 1, 2 and 3. Archaeological Salvage excavation report

Following the archaeological survey and assessment of the Bungarribee Masterplan completed by Artefact Heritage in 2014, it was determined that 11 sites would be impacted as part of proposed works within the Precinct. Based on recommendations from Artefact Heritage, archaeological salvage was included within the Operational Conditions of the AHIP. A total of 55 1m by 1m excavation units were excavated within the study area in two locations named Bungarribee North and Bungarribee South.

The Bungarribee North salvage area was situated within the South Creek soil landscape within an undulating floodplain landform in close proximity to Eastern Creek. A total of 287 stone artefacts, weighing a maximum total of 148.35 grams, were recovered from 18 excavation units. The salvage excavations undertaken at Bungarribee North uncovered a moderate density stone artefact assemblage which exhibits some distinctive types of stone reduction activities. The stone artefact analysis demonstrated that knapping events were undertaken in this location, particularly within the area of the Stage II excavations (this is where the majority of the formal tools were identified). The formal tool types are associated with the Australian Small Tool Tradition and are typical of a Bondaian assemblage (likely dating anywhere from 8,000 BP up until the contact period). Preference of raw material use for the production of formal tools is indicated as all of the tools were composed of mudstone. No silcrete tools were identified.

The Bungarribee South salvage area was situated within the Blacktown soil landscape on raised terrain associated with a first order watercourse flowing into the Bungarribee and Eastern Creek floodplains. A total of 37 units were excavated within this area. A total of 346 stone artefacts, weighing a maximum total of 935.76 grams, were recovered from the Bungarribee South area as a result of the salvage excavations.

The salvage excavations undertaken at Bungarribee South uncovered a low density stone artefact assemblage of small to medium size flakes, angular fragments and cores. One artefact was identified as having some scalar retouch with evidence of usewear and defined as a utilised flake. The raw materials utilised at the site are common in the region. No evidence of intensive occupation of the site or the manufacture of stone tools was identified. The assemblage was interpreted as opportunistic general stone reduction and discard rather than intensive occupation or site use reflective of transient campsites related to the movement of Aboriginal people across the landscape.

The salvage excavations revealed that the landform contexts are associated with two different types of archaeological sites which exhibit different types of stone artefact reduction techniques or behaviours.

4.4 Archaeological Implications for the Study Area

Previous excavations within the Bungarribee Precinct have revealed the potential for high density artefact scatters to occur in association with Eastern Creek and Bungarribee Creek floodplain. Excavations have indicated that the intensity of occupation as evidenced by the density and complexity of the artefact assemblage varies according to landform. There is potential for artefacts to occur throughout the Bungarribee Precinct in varying densities according to landform and disturbance levels.

5.0 SITE DESCRIPTION

5.1 Sydney Zoo PAD02 (SZ PAD02)

Sydney Zoo PAD02 is located on a hill crest overlooking Eastern Creek (Figure 5). The PAD area is approximately 275m east of Eastern Creek, 300m west of an unnamed first order watercourse and 60m north of registered AHIMS site Bungarribee 18 Blacktown (#45-5-0465). The PAD area was covered by dense grass at the time of survey and visibility was nil (Plate 1). However, the area appeared to have been minimally disturbed and the landform was assessed to be intact. The PAD is located within the area identified to have moderate archaeological potential by JMcD CHM (2006) and Artefact Heritage (2014 and see Figure 4).

Plate 1: View north across SZ PAD02 towards unnamed first order watercourse, 1 metre scale



Figure 5: Location of SZ PAD02

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6.0 AIMS OF ARCHAEOLOGICAL TEST EXCAVATION

6.1 Aims of Test Excavation

The archaeological survey conducted for the current assessment recorded very low surface visibility across the study area due to dense grass cover. Because of this low surface visibility in most areas, landform observations and information from previous archaeological investigations within the Bungarribee Precinct were used to inform the selection of areas of PAD.

SZ PAD02 is located on a crest landform that descends to the west towards Eastern Creek. This PAD is located within a landform that has not been tested previously within the Bungarribee Precinct.

This test excavation has been carried out in accordance with the OEH Code of Practice to ensure best practice.

In accordance with the OEH Code of Practice the aims of archaeological test excavations are:

- To adequately identify the extent of SZ PAD02.
- To assess the scientific significance of SZ PAD02 following an assessment of the test excavation results.
- To provide an opportunity for registered Aboriginal stakeholders to comment on the Aboriginal cultural heritage values of the site.
- To provide the proponent with recommendations on opportunities to avoid impact and future requirements for further archaeological investigations where required.

6.2 Excavation Methodology

Under the Code of Practice, a maximum of 0.5 per cent of the area under investigation may be excavated within an AHIP. A summary of the total area and total excavation area at SZ PAD02 is outlined in Table 2 below.

Table 2: Excavated area at SZ PAD02

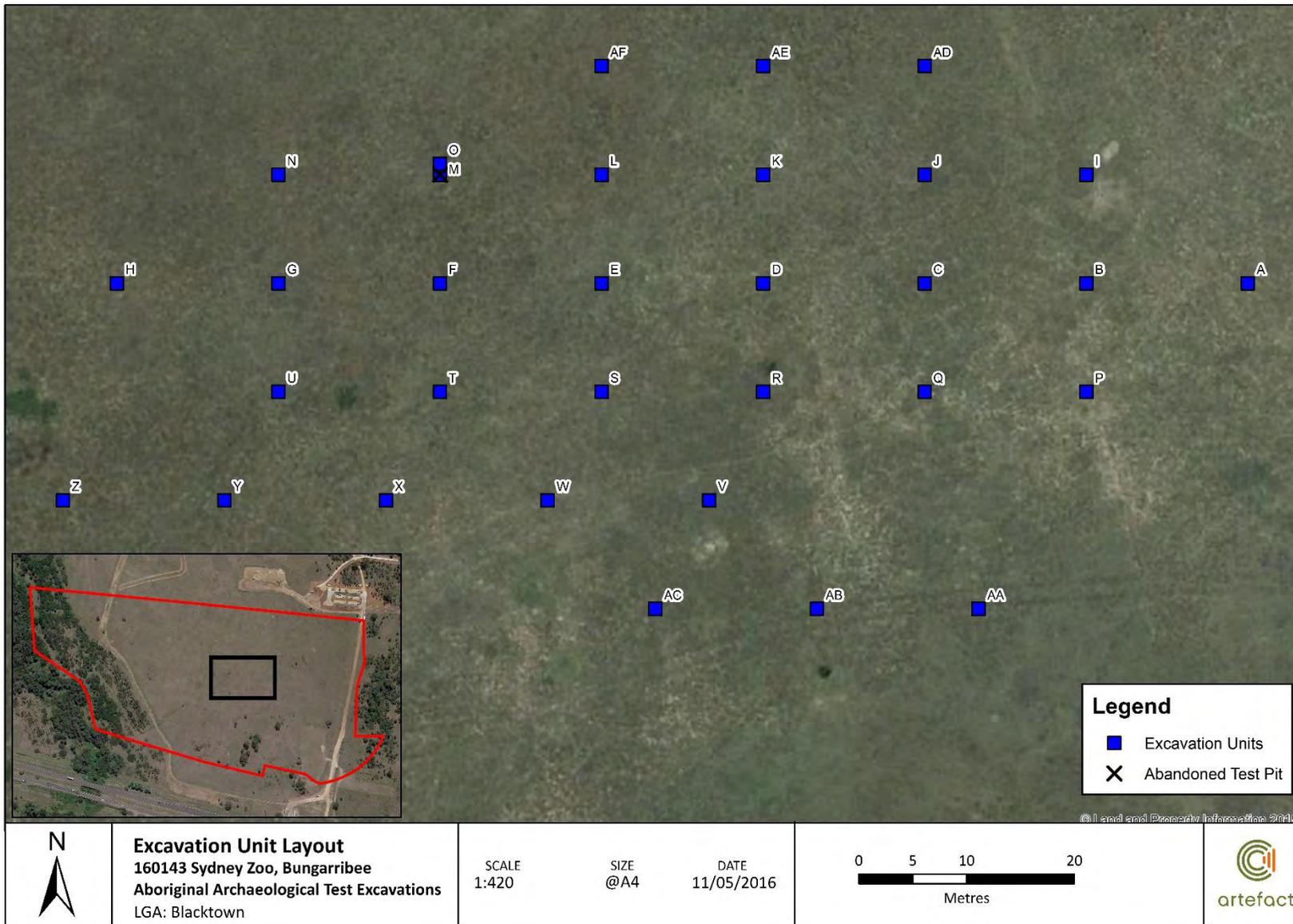
PAD	Total areal extent of PAD	Proposed excavation area (metres ²)	Proposed excavated percentage of total area
TNRB PAD02	5578m ²	5-7.5	0.09%-0.13%

6.2.1 Test excavation layout and excavation units

A central transect was laid out between the easternmost and westernmost coordinates of the PAD using long hand-tapes. A total of eight test pits were marked at 15 metre intervals along this transect using flags and pegs. A further three transects were established to the south and a further two transects to the north were established by triangulation. The transects were spaced 10m apart. An alphabetical labelling system was established to name the excavation units (Figure 6)

A total of 30 50cm x 50cm test excavation units were excavated. Excavation unit (herein referred to as unit) M was abandoned when a cable was uncovered halfway through spit 2. Unit O was offset 1 metre north of unit M to ensure even coverage of the PAD. A total of 7.5m² was excavated. The location of each excavation unit was recorded using a hand-held non-differential GPS.

Figure 6: location of excavation units



6.2.2 Excavation procedure

In accordance with the OEH Code of Practice, the initial excavation unit was excavated in 5 centimetre spits. Subsequent excavation units were excavated in 10 centimetre spits to the base of the artefact bearing deposit. Where time allowed and further investigation was required for particular areas, the Code of Practice allows for excavation units to be combined to open an area no larger than three square metres. Open area excavation was not deemed appropriate in the field due to the low numbers of artefacts.

A context sheet for each excavation unit was completed in the field. Details recorded will include date of excavation, name of excavators, depth, number of buckets and soil description. Additionally, one representative section wall from each excavation unit was scale drawn, and photographs were recorded of each section wall and base.

All retrieved deposit from each excavation unit was placed in buckets and transported to a sieve area using wheelbarrows. All retrieved deposit was sieved using nested 5 millimetre and 3 millimetre sieves.

All excavation units were back-filled with clean fill and sieve spoil following the completion of test excavation using a rubber tracked back-hoe.

6.2.3 Procedure for the discovery of human remains

Under the OEH Code of Practice archaeological test excavation must cease when suspected human remains are encountered.

If suspected human skeletal remains were uncovered at any time throughout the excavation program, the following actions would have been followed:

- Cease all excavation activity;
- Notify NSW Police;
- Notify OEH via the Environment Line 131 555 to provide details of the remains and their location, and;
- Excavation activity will not recommence unless authorised in writing by OEH.

No human remains or suspected human remains were identified during the test excavation program.

6.2.4 Aboriginal objects

All Aboriginal objects retrieved during the course of test excavation were washed and placed in re-sealable bags for further analysis and recording. Once test excavation was completed, the artefact assemblage was recorded and stored as stipulated in the OEH Code of Practice. This included recording key attributes of material, artefact type, platform type, termination type and dimensions, as well as a photographic record of representative artefacts (see Table 3). All recorded information was entered into a Microsoft Excel table with detail linked to the provenance of each artefact. Once entered into the Excel table, the data can be readily supplied with the test excavation report to OEH and registered Aboriginal stakeholders in either electronic or hard-copy form. An archaeologist experienced in stone artefact recording conducted the attribute recording and analysis.

All artefacts were given a unique number and stored in double re-sealable snap lock bags. A permanent marker was used to record the provenance and unique number of artefacts in each bag in writing on the outside of the bag and on an archival grade tag such as Dupont™ Tyvek® paper.

Long-term care and management of the retrieved archaeological assemblage was discussed with Aboriginal stakeholders through the methodology review process and preparation of the ACHAR.

Table 3: Recorded artefact attributes

Artefact attributes	Recorded details
Site Details	Site name.
Excavation Unit	Location of the northwest corner of the excavation unit on the X Y grid.
Spit	Spit number.
Raw material	Raw material type and colour. Raw material type included: silcrete (SIL), Indurated Mudstone Tuff (IMDT), quartz (QZ), and Fine Grained Siliceous Stone (FSS).
Typological class/ reduction type	Flake; proximal flake fragment; medial flake fragment; distal flake fragment; bipolar flake; longitudinally broken flake; angular fragment; crenate fracture.
Formal tool type (if applicable)	Backed; retouched; core – unifacial, unifacial rotated, bifacial; core fragment
Dimensions	Oriented length, width and thickness of complete flakes.
Size range	Maximum dimension in the following categories – 0-5 mm, 6-10 mm, 11-15 mm, 16-20 mm, 21-25 mm.
Cortex	Cortex coverage of whole artefact.
Weight	Measured to the 0.1gm. Artefacts less than 0.05gm were rounded up to 0.05 gm, whilst artefacts greater than 0.05 gm were rounded up to 0.1 gm.

7.0 RESULTS

7.1 Dates and Personnel

Test excavation was conducted over four days between Tuesday 26 April and Friday 29 April 2016. Representatives of three Aboriginal stakeholder groups and archaeologists from Artefact Heritage took part in the test excavation program. The excavation attendants are listed in Table 4.

Table 4: Test excavation attendees

Name	Organisation
[REDACTED]	[REDACTED]

7.2 Soils, Disturbances and Features

The soil profile at SZ PAD02 can be characterised as a fairly homogenous clayey silt A Horizon overlying a dense mottled reddish brown clay B Horizon. The deposit was generally deeper within the north western portion of the PAD. The depth excavated in this area ranged from 151mm to 290mm. Small (5-20mm) angular and sub-angular gravels (>5%) were observed throughout the deposit generally consisting of ironstone and shale.

The deposit was shallower within the eastern half of the PAD where the natural A horizon appeared to have been stripped (Figure 7). This trend can be observed in the excavation depths of the eastern, northern and southern excavation units. These units were generally excavated between 50mm and 180mm. Very little top soil was observed in these units with basal clay occurring within the first spit in some units (i.e. units I, Q and P). The A horizon that remained in this area of the PAD was generally lighter in colour than the western pits.

The deposit within the north western excavation units demonstrated variable levels of disturbance. The transition between the A1 and A2 horizons was quite defined in some units (i.e. unit G) whilst it appeared to be diffuse in other units (i.e. unit F). This suggests that some bioturbation through natural or anthropogenic means has occurred within some parts of the western portion of the site.

The average excavation unit depth was 140mm below ground surface with the deepest unit (G) excavated to 290mm and the shallowest units (I and Q) excavated to 50mm. There were no features identified within any of the excavation units. Once the initial unit had determined that the clay layer was sterile, all remaining excavation ceased at the sterile dense clay layer.

Example soil profile form western portion of SZ PAD02

- Context 1 (A1 horizon) – Brown friable clayey silt with frequent rootlets
- Context 2 (A2 Horizon) – Dark brown clayey silt with ironstone and shale inclusions
- Context 3 (B Horizon) – Dark reddish brown and orange mottled dense clay with infrequent ironstone and shale inclusions

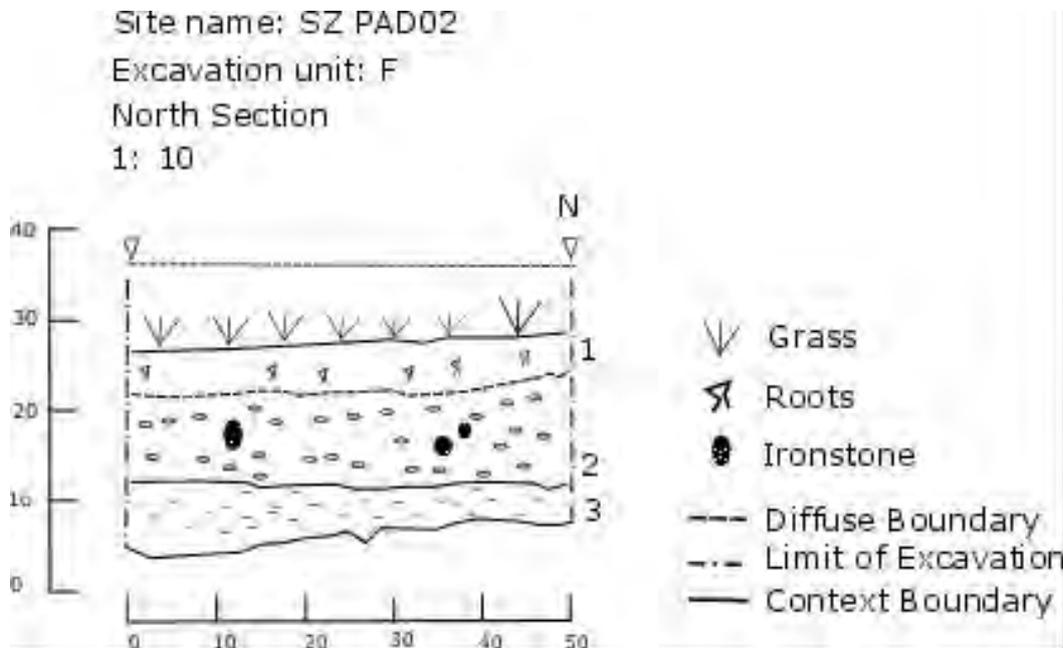


Plate 2: Excavation unit F North Section



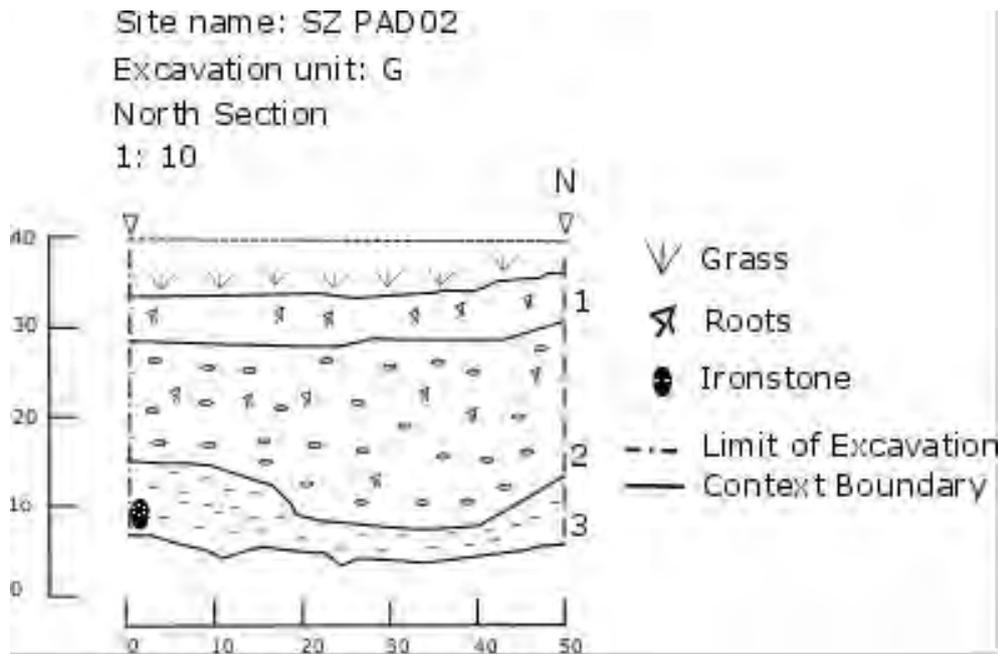


Plate 3: Excavation unit G north section



Example soil profile form eastern portion of SZ PAD02

- Context 1 (A1 horizon) –Brownish grey friable clayey silt with frequent rootlets
- Context 2 (A2 Horizon) – Dark brown clayey silt with ironstone and shale inclusions
- Context 3 (B Horizon) – Dark reddish brown and orange mottled dense clay with infrequent ironstone and shale inclusions

Site name: SZ PAD02
Excavation unit: T
North Section
1: 10

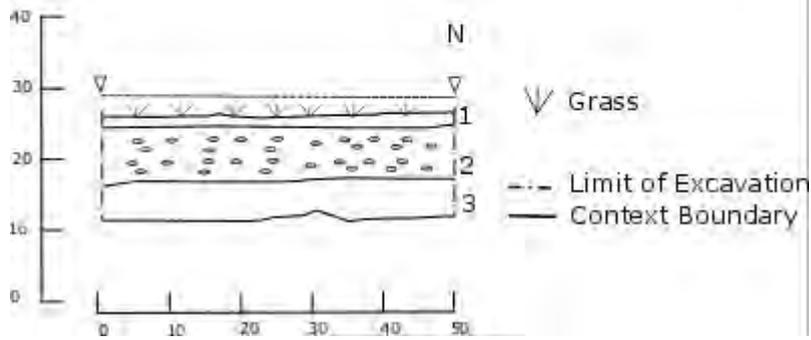
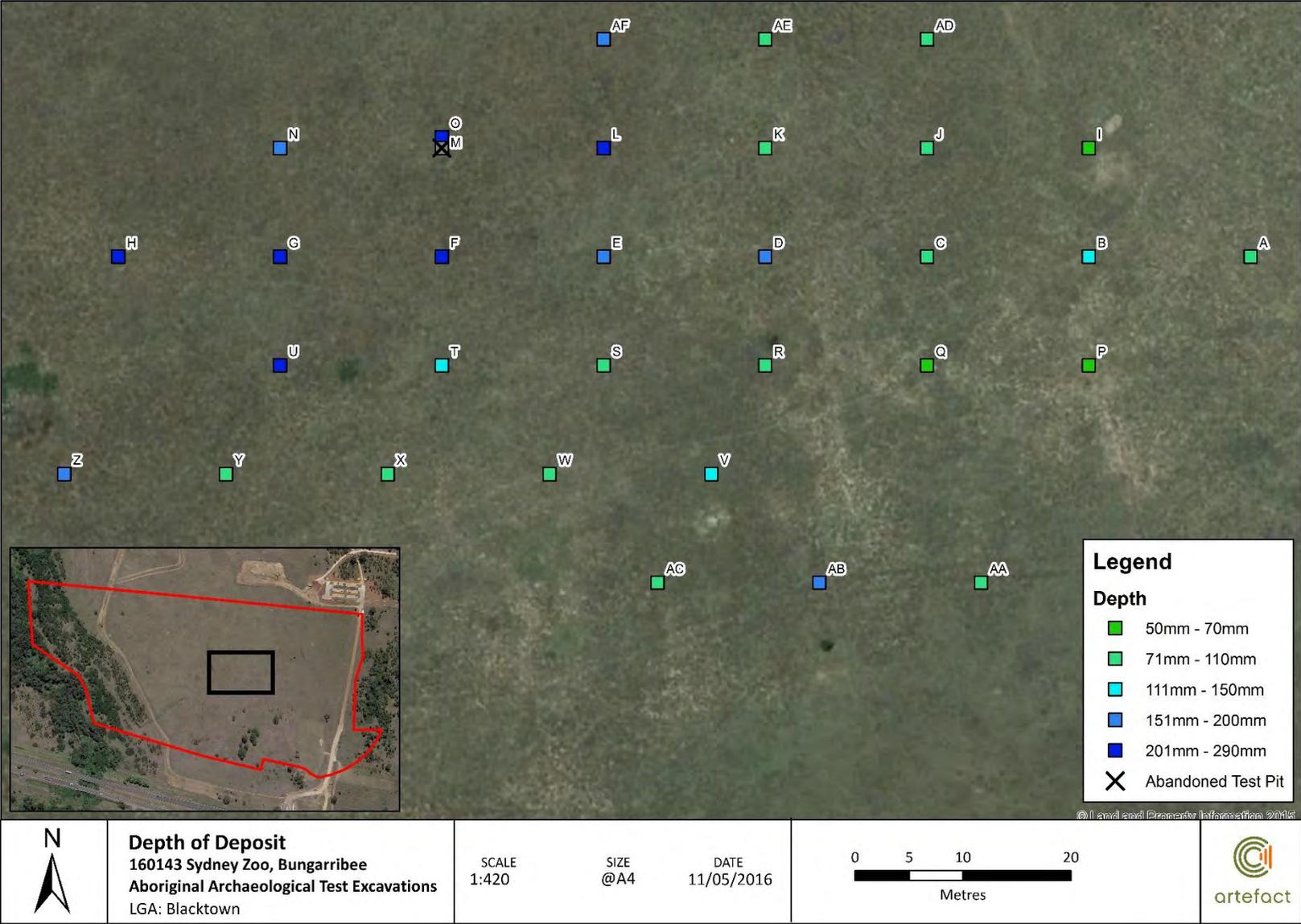


Plate 4: Excavation unit T north section



Figure 7: Depth of deposit



7.3 Artefact Assemblage

The artefact assemblage retrieved from SZ PAD02 consists of 31 artefacts retrieved from a total of 14 excavation units. Artefacts were generally distributed across the site, with the majority of the assemblage recovered from the western excavation units. The assemblage includes silcrete, quartz and fine grained siliceous raw materials and consists of flakes, flake fragments, angular fragments and a core.

7.3.1 Stone artefact density and distribution

Over half of the assemblage was recovered from nine excavation units within the western half of the PAD (n=24, 77%). The majority of the artefact bearing excavation units were located on the central transect (units A, B, C, E, F, G, H). The distribution of artefacts across the site indicates a sparse background scatter with a clear delineation between the eastern and western excavation units (Figure 8).

Low numbers of artefacts were retrieved from excavation units located within the higher eastern portion of the site. Artefacts were retrieved from units A, B, C and Q with the highest number of artefacts retrieved from units A and A (n=2 per unit) and only 1 artefact retrieved from units B, C and Q. The units to the north and south of these four units were all void of artefacts.

The western half of the PAD area is located on the crest break of slope and forms a gentle slope gradient towards Eastern Creek. The highest number of artefacts retrieved from this area was 4 from units E, F and H. These units are located at the western end of the central transect. The rest of the units contained 2 (units G, U, V and Y) to 3 artefacts (unit L). There was 1 artefact retrieved unit M however this unit was abandoned after a cable was identified at the end of spit 1.

To ensure greater coverage of the testing area two transects of three excavation units each were established across the northern and southern areas of the PAD (Southern transect units AA, AB and AC; northern transect units AD, AE and AF). These units were all devoid of artefacts.

Spit 1 (0-100mm) contained the largest number of artefacts (n=18, 58%), whilst spit 2 (111-200mm) contained 11 artefacts (35%) and only 1 artefact was recovered from spit 3 (3%). There is a clear delineation of the eastern and western portions of the PAD. The higher number of artefacts located within the western units corresponds to the low levels of disturbance observed throughout this area of the PAD.

7.3.2 Raw material and artefact characteristics

The artefact assemblage predominantly consists of silcrete (n=27, 87%). Quartz (n=2, 6% see Plate 5) and fine grained siliceous (n=2, 6%) raw materials are also present. The silcrete occurred in red (n=21 67%), pink (n=4, 13%) and yellow (n=2, 6% see Plate 7).

The assemblage is composed of complete flakes (n=10, 32%, see Plate 8) and flake fragments, including proximal (n=3 10%, see Plate 9), medial (n=2, 6%, see Plate 10), distal (n=5, 16%, see Plate 11), longitudinally broken flakes (n=5, 16%) and longitudinally transverse broken flakes (n=1, 3%). There was only one multiplatform core (3%) retrieved from the excavation and the rest of the assemblage is composed of angular fragments (n=4, 3%, see Plate 12). Two of the longitudinally broken flakes were found to be conjoining flakes (artefacts #6 and #5, see Plate 14). The break appears to have occurred after the flake was struck from the core. Both flakes were retrieved from unit E spit 1.

The artefact assemblage was generally very small with the average complete flake length measuring 15.5mm. The smallest complete flake was recorded as 6.69mm (artefact #26) and the largest complete flake recorded measured 38.41mm (artefact #31).

There were no formal tools identified within the assemblage and no evidence of retouch or usewear on any of the artefacts. Evidence of platform preparation was observed on the dorsal surface of artefact #28 (see Plate 15 and Plate 16). The shape of the artefact does not appear to be suitable for hafting however and no evidence of usewear or retouch was observed on the lateral or distal margins.

Plate 5: Quartz artefacts from left to right – artefacts #13 and #23

Plate 6: Fine grained siliceous complete flake, artefact #28



Plate 7: Silcrete from left to right yellow #24, pink #9 and red #25 silcrete



Plate 8: Complete flakes, from left to right – artefacts #21, #2 and #27

Plate 9: Proximal flake fragments, from left to right – artefacts #22, #23 and #9



Plate 10: Medial flake fragments, from left to right – artefacts #12 and #11



Plate 11: Distal flake fragments, from left to right – artefacts #30, #8, #16, #15, and #10



Plate 12: Angular fragments, from left to right – artefacts #17, #13 and #14



Plate 13: Longitudinally broken flakes, from left to right artefacts - #4, #5, #29, #6 and #25



Plate 14: Artefacts #5 and #6 silcrete conjoin flake



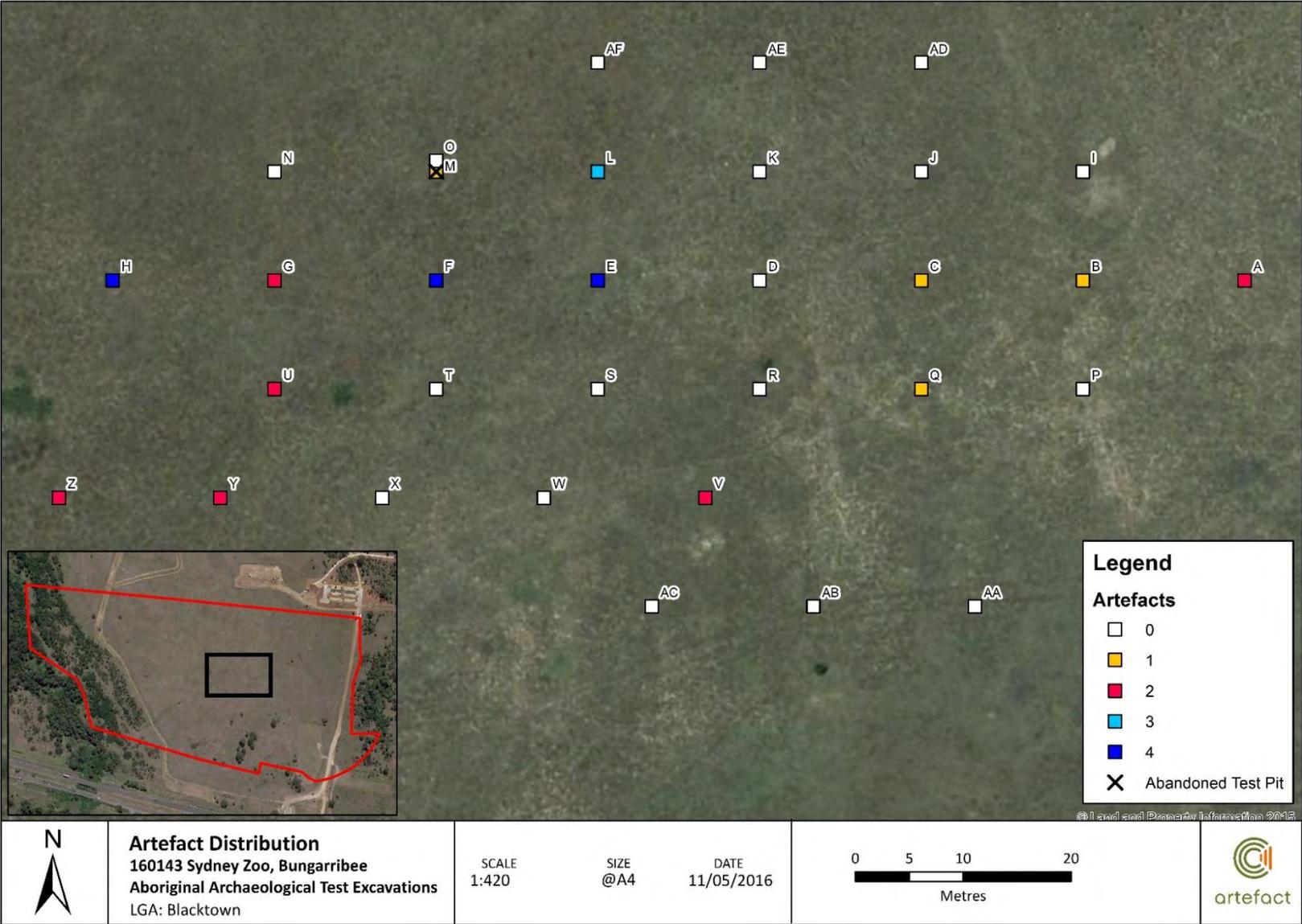
Plate 15: Platform preparation on dorsal surface artefact #28



Plate 16: Dorsal surface, artefact #28



Figure 8: Distribution of artefacts



8.0 ANALYSIS AND DISCUSSION

8.1 Levels of Disturbance

Disturbance was observed throughout the eastern portion of the PAD area. The deposit within this area was generally shallower than in the western portion with the basal clay horizon occurring after one spit and even 50mm in some units (for example units I and Q). This area of the PAD appears to have been impacted to a greater degree by the communications infrastructure formerly located in the vicinity of the PAD. Evidence of this disturbance was also found on the surface to the south of units J and I.

The western portion of the site appeared to have been impacted to a lesser extent than the eastern portion. This is mainly due to the depth of deposit within this area. However, the homogenous nature of the A horizon observed in this area of the PAD suggests a degree of vertical mixing of the deposit. This kind of disturbance may be caused by natural processes such as bioturbation through root and animal activity or through anthropogenic processes such as crop cultivation. The identification of a conjoin flake within spit 1 of unit E suggests that these processes have not impacted greatly on the locations of artefacts themselves.

8.2 Artefact Assemblage

The artefact assemblage retrieved from SZ PAD02 consists of predominantly small silcrete flaked artefacts with minimal to no cortex. The reduction types present within the assemblage include angular fragments, complete flakes, broken flakes and one core. There was no backing or retouch observed on any of the artefacts and no formal tools were identified within the assemblage. It is difficult to assign the assemblage to any particular tool tradition given the absence of technological identifiers.

8.2.1 Aboriginal settlement history

The analysis of the assemblage from SZ PAD02 indicates that the site was unlikely to have been used as campsite for prolonged periods of time. Rather the low density and nature of the reduction types recorded are indicative of ephemeral and opportunistic occupation use of the site. The low number of cores, small size of the artefacts and absence of knapping floors could suggest that the knapping of tools occurred elsewhere and the artefact assemblage is indicative of tool maintenance. This is further supported by the absence of features such as hearths which would indicate use of the site as a camp.

8.2.2 SZ PAD02 and the local context

Previous excavations within the Bungarribee Precinct have investigated the archaeological potential of representative landforms within the Precinct. These investigations have highlighted the contrasting land-use patterns that emerge through the comparison of the results of the excavations.

Excavations conducted at #45-5-3883 revealed high artefact densities indicative of multiple occupation events associated with the lower hill slope landform near the confluence of Bungarribee and Eastern Creek (JMcd CHM 2011). Excavations within the undulating floodplain (Bungarribee North) associated with Eastern Creek have also identified high artefact densities and the employment of a variety of reduction techniques (Artefact Heritage 2015).

Excavations conducted at Bungarribee South recovered a low density artefact scatter within a lower hill slope landform associated with a first order watercourse (Artefact Heritage 2015). The salvage

excavations conducted at #45-5-3255 also recovered low artefact densities within the low terrace landform associated with Eastern Creek.

By combining these results with the current study it appears that the stream order model proposed by White and McDonald largely holds for the Bungarribee Precinct. This model assumes that higher densities and more complex assemblages would occur predominantly within lower hill slopes and raised terraces within 100 metres of a major watercourse (White and McDonald 2010). The artefact assemblages retrieved from #45-5-3883, 45-5-3255, Bungarribee North, Bungarribee South and SZ PAD02 all conform to this assumption.

8.3 Conclusion

A total of 31 artefacts were retrieved during the test excavation program. A total of 30 50cm by 50cm test excavation units were excavated resulting in a total excavation area of 7.5 metres². The majority of artefacts were recovered from the western end of the central transect. The distribution of artefacts across the PAD indicates two separate concentrations of artefacts within the western portion and eastern portion of the PAD.

The assemblage consists of three raw material types, silcrete, quartz and fine grained silicious, with silcrete being predominant. Reduction types present within the assemblage are complete flakes, angular fragments, flake fragments and a core. There was no evidence of retouch or usewear on any of the artefacts. The assemblage is indicative of general stone reduction and discard with no evidence to suggest that SZ PAD02 was subject to sustained occupation.

The assemblage is considered to be representative of stone artefact assemblages within the Cumberland Plain. SZ PAD02 is considered to conform to the predictive model developed for the Bungarribee Precinct.

Following the test excavation results SZ PAD02 and the identification of Aboriginal objects the PAD has been divided into two sites and renamed Sydney Zoo Artefact Scatter 01 (SZ AS01) and Sydney Zoo Artefact Scatter 02 (SZ AS02 see Figure 9).

Figure 9: Sydney Zoo Artefact Scatter 01 and 02

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9.0 SIGNIFICANCE ASSESSMENT

9.1 Assessment Criteria

This significance assessment has been undertaken in accordance with the OEH *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales 2011*.

Archaeological significance refers to the archaeological or scientific importance of a landscape or area. This is characterised by using archaeological criteria such as archaeological research potential, representativeness and rarity of the archaeological resource and potential for educational values. These are outlined below:

- Research potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity: is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential: does the subject area contain teaching sites or sites that might have teaching potential?

9.2 Archaeological Significance Assessment

9.2.1 Sydney Zoo Artefact Scatter 01 (SZ AS01 AHIMS #45-5-4772)

The archaeological test excavation at SZ AS01 identified a dispersed low density artefact scatter. The assessment of archaeological significance of SZ AS01 considered the following aspects of the test excavation results:

- The results reflect a mostly diffuse, low density artefact scatter indicating ephemeral use of the area by Aboriginal people.
- The artefact type and raw materials are common within the Cumberland Plain and the Bungarribee Precinct.
- The artefacts recovered during the test excavation program off low research or educational value.

Based on the results of the test excavation SZ AS01 (#Pending) has been assessed as demonstrating low archaeological significance. The site demonstrates low representative, rarity and education values.

9.2.2 Sydney Zoo Artefact Scatter 02 (SZ AS02 AHIMS #45-5-4771)

The archaeological test excavation at SZ AS02 identified a low density artefact scatter. The assessment of archaeological significance of SZ AS01 considered the following aspects of the test excavation results:

- The results reflect a mostly diffuse, low density artefact scatter indicating ephemeral use of the area by Aboriginal people.
- The artefact type and raw materials are common within the Cumberland Plain and the Bungaribee Precinct.
- The artefacts recovered during the test excavation program off low research or educational value.

Based on the results of the test excavation SZ AS02 (#45-5-4771) has been assessed as demonstrating low archaeological significance. The site demonstrates low representative, rarity and education values.

Table 5: Significance assessment

Site	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
SZ AS01 (#45-5-4772)	Low	Low	Low	Low	Low
SZ AS02 (#45-5-4771)	Low	Low	Low	Low	Low

10.0 IMPACT ASSESSMENT

The proposed works would directly impact SZ AS01 and SZ AS02 resulting in total loss of value. This assessment is summarised in Table 6 below.

Table 6: Impact assessment

Site number/name	Type of harm	Degree of harm	Consequence of harm
#45-5-4772/ SZ AS01	Direct	Total	Total loss of value
#45-5-4771/ SZ AS02	Direct	Total	Total loss of value

Figure 10: Proposed impacts to Aboriginal sites

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11.0 MITIGATION AND MANAGEMENT

11.1 Guiding Principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved. If conservation is not practicable, measures should be taken to mitigate against impacts to Aboriginal sites.

The nature of the mitigation measures recommended is based on the assessed significance of the sites. The final recommendations would also be informed by cultural significance, which will be discussed by the Aboriginal community in their responses during the next stage of consultation.

11.2 Mitigation Measures

Sites SZ AS01 and SZ AS02 have been assessed as demonstrating low archaeological significance. No further archaeological investigation is required prior to impacts taking place at either of these sites.

11.2.1 Long term management of test excavation artefact assemblage

Further information on the long-term care and management of the retrieved artefact assemblage is included in the ACHAR.

12.0 RECOMMENDATIONS

The following recommendations are based on consideration of:

- Statutory requirements under the *National Parks and Wildlife Act 1974* as amended
- The recommendations of the ASR
- The interests of the Aboriginal stakeholder groups
- The likely impacts of the proposed development

It was found that:

- Two dispersed artefacts scatters were identified at the PAD SZ PAD02. These artefact scatters have been designated the site names SZ AS01 and SZ AS02.
- Stone artefact scatters are considered to be common within the Cumberland plan.
- Sites SZ AS01 and SZ AS02 have both been assessed to be of low archaeological significance.

It is therefore recommended that:

- Aboriginal sites SZ AS01 and SZ AS02 have been assessed to be of low archaeological significance. No further archaeological investigation is recommended for either of these sites.
- Long term care of excavated artefacts, such as reburial would be undertaken in accordance with the Code of Practice and the recommendations of registered Aboriginal stakeholders.
- Site recording forms would be submitted to AHIMS for SZ AS01 and SZ AS02.

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artefact

Artefact Heritage
ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia
+61 2 9518 8411
office@artefact.net.au
www.artefact.net.au

Appendix F: AHIMS site cards

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artefact

Artefact Heritage

ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au
www.artefact.net.au