QUEANBEYAN-PALERANG REGIONAL SPORT COMPLEX
SITE, SOUTH JERRABOMBERRA, NSW

ABORIGINAL TEST EXCAVATION REPORT

Report to Queanbeyan-Palerang Regional Council

April 2021

APEX ARCHAEOLOGY

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Executive Summary

Apex Archaeology were engaged to undertake an archaeological test excavation in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (April 2011); the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, April 2010) (the ACHCRs); and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (September 2010) (the Code of Practice), in advance of a proposed development for the Queanbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW.

Navin Officer Heritage Consultants undertook Aboriginal community consultation in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010), with the results of the consultation presented in NOHC 2020 *Queanbeyan Palerang Regional Sport Complex, South Jerrabomberra Archaeological Assessment and Aboriginal Cultural Heritage Assessment*. Additional consultation is detailed in a supplementary report prepared by Apex Archaeology. This report builds on the results of that archaeological assessment, and presents the results of the test excavations undertaken within the area identified as PAD1-South within the study area.

The project is within the Queanbeyan-Palerang Regional Council (QPRC) area. The proponent for the project is QPRC. This report details the results of the archaeological test excavation completed in accordance with the Code of Practice and the consultation undertaken with the Aboriginal community in accordance with the ACHCRs.

The study area comprises Lot 1 DP 313299 and Lot 6 DP 239080. It is proposed to construct a regional sporting hub which would provide a sporting centre of excellence servicing Queanbeyan and the wider southern tablelands, along with associated carparking, infrastructure and landscaping within the area.

Test excavations were completed over two weeks in September/October 2020. Test excavations were undertaken with an area of Potential Archaeological Deposit (PAD) located along Jerrabomberra Creek within the study area. Areas for test excavation were selected based on the PAD identified by NOHC and areas that would be impacted as a part of the QPRC proposal. The level of disturbance from the previous land use as a raceway and associated access tracks and carparking has dramatically reduced the amount of area considered to be minimally impacted within this area.

A total of 63 test pits were excavated within the study area. No archaeological material was recovered from these test pits, which were excavated to a maximum depth of 80cm.

A subsequent geomorphological assessment of the area identified potential for buried land surfaces to be present within the alluvial deposits bordering the creekline. A sample was taken at 80cm depth for radiocarbon dating, as this was

considered an appropriate analysis to determine the approximate age of this potential land surface, to inform whether it may have been a viable occupation level for Aboriginal habitation. The assessment concluded that these deep deposits were formed through both fluvial and alluvial processes, and sediments deposited under alluvial conditions may have been inhabitable in the past. Fluvial stratigraphic units should be excluded from further archaeological investigation.

The radiocarbon dating returned a result of 2421±13 BP (Appendix D), indicating deposits which are now at a depth of approximately 80cm may have been inhabited by Aboriginal people in the past. There is evidence of Aboriginal occupation in the Queanbeyan region dating back at least 5,000 years and potentially up to 25,000 years.

As such, further investigations of these deep deposits are considered necessary to determine if there is any evidence of Aboriginal occupation within the areas proposed to be impacted by the deep excavations required for the project. These investigations would need to be undertaken under an Aboriginal Heritage Impact Permit (AHIP) due to the depths necessary to excavate to confirm the nature and extent of any potential archaeological deposits within this area. A methodology for undertaking these further investigations is attached in Appendix B of this report.

In summary, the archaeological investigation of the area identified the following:

- No archaeological material was identified within the testing of the area designated PAD1-South (AHIMS #57-2-0975).
- PAD1-South is considered to be highly disturbed throughout on the surface, and no surface or subsurface archaeological material was identified within the top 80cm of deposit during the test excavation program.
- There remains some potential for archaeological deposits to be present at depth and further investigation of these deep deposits is required under an AHIP.
- The PAD1-South boundary has been refined through preparation of an Aboriginal Site Impact Recording Form (ASIRF).
- Site SJ01 was relocated and reassessed, and is considered to be machine impacted material in a highly disturbed context. This site has not been listed on the AHIMS register by the archaeologist who identified the site. As the area is not considered to contain archaeological material, the site should not be registered on AHIMS.

Based on the results of the cultural heritage and archaeological assessments, the following recommendations have been made for the project:

Recommendation 1: AHIP Application Necessary

There is some potential for archaeological deposits to be present within the deep alluvial deposits bordering the creekline. Further investigation of the areas proposed to be impacted within these areas is required. It is proposed to utilise machine auguring to investigate these areas due to the depth of deposit present, which is up

to 5m. As such, an application for an AHIP will be necessary, as auguring is not permitted under the Code of Practice.

Any further archaeological investigation would likely require a further AHIP application, either to permit harm to archaeological deposits identified, or to permit further salvage excavation in the event extensive archaeological deposits are present.

RECOMMENDATION 2: STOP WORK PROVISION

In the unlikely event that suspected human remains are identified during construction works, all activity in the vicinity of the find must cease immediately and the find protected from harm or damage. The NSW Police and the Coroner's Office must be notified immediately. If the finds are confirmed to be human and of Aboriginal origin, further assessment by an archaeologist experienced in the assessment of human remains and consultation with both Heritage NSW and the RAPs for the project would be required.

This recommendation should be included in any Construction Environmental Management Plan developed for the site.

RECOMMENDATION 3: SITE BOUNDARIES

If there is any change to the boundaries of the proposed development to include areas not assessed as part of this archaeological investigation, further investigation of those areas should be completed to assist in appropriately managing Aboriginal objects and places which may be present.

RECOMMENDATION 4: REPORTING

One digital copy of this report should be forwarded to Heritage NSW to assist in the assessment of the AHIP application for the project.

One digital copy of this report should be forwarded to the AHIMS registrar for inclusion on the AHIMS database.

One copy of this report should be forwarded to each of the registered Aboriginal stakeholders for the project.

Apex Archaeology would like to acknowledge the Aboriginal people who are the traditional custodians of the land in which this project is located. Apex Archaeology would also like to pay respect to Elders both past and present.

Document Control

The following register documents the development and issue of the document entitled 'Queanbeyan-Palerang Regional Sport Complex Site, South Jerrabomberra, NSW: Aboriginal Cultural Heritage Assessment Report', prepared by Apex Archaeology in accordance with its quality management system.

Revision	Prepared by	Reviewed by	Issue Date
1 – Draft	Leigh Bate	Jenni Bate	20 November 2020
2 – Draft	Leigh Bate	Gayle Carey/Tim Geyer	23 November 2020
3 – Final	Leigh Bate	RAPs	14 January 2021
4 – Final	Jenni Bate	HNSW	24 April 2021

GLOSSARY OF TERMS

Aboriginal Object	An object relating to the Aboriginal habitation of NSW (as defined in the NPW Act), which may comprise a deposit, object or material evidence, including Aboriginal human remains.
ACHA	Aboriginal Cultural Heritage Assessment
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System maintained by Heritage NSW, detailing known and registered Aboriginal archaeological sites within NSW
AHIP	Aboriginal Heritage Impact Permit
ASIRF	Aboriginal Site Impact Recording Form
BP	Before Present, defined as before 1 January 1950.
Code of Practice	The DECCW September 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*
Consultation	Aboriginal community consultation in accordance with the DECCW April 2010 *Aboriginal cultural heritage consultation requirements for proponents 2010.*
DA	Development Application
DECCW	The Department of Environment, Climate Change and Water (now Heritage NSW)
Disturbed Land	If land has been subject to previous human activity which has changed the land's surface and are clear and observable, then that land is considered to be disturbed
DPIE	Department of Planning, Industry and Environment
Due Diligence	Taking reasonable and practical steps to determine the potential for an activity to harm Aboriginal objects under the *National Parks and Wildlife Act 1974* and whether an application for an AHIP is required prior to commencement of any site works, and determining the steps to be taken to avoid harm
Due Diligence Code of Practice	The DECCW Sept 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*
GIS	Geographical Information Systems
GSV	Ground Surface Visibility
Harm	To destroy, deface or damage an Aboriginal object; to move an object from land on which it is situated, or to cause or permit an object to be harmed
Heritage NSW	Heritage NSW in the Department of Premier and Cabinet, responsible for overseeing all heritage matters in NSW. Incorporates the former DPIE/OEH and Heritage Branch.
ka	Kiloannus, a unit of time equating to 1,000 years
LALC	Local Aboriginal Land Council
LGA	Local Government Area
NPW Act	NSW *National Parks and Wildlife Act* 1974
OEH	The Office of Environment and Heritage of the NSW Department of Premier and Cabinet (now Heritage NSW)
PAD	Potential Archaeological Deposit
QPRC	Queanbeyan-Palerang Regional Council
RAPs	Registered Aboriginal Parties

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APPENDICES

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1.0 Introduction

Apex Archaeology were engaged by Queanbeyan-Palerang Regional Council (QPRC) to undertake an archaeological test excavation in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (April 2011); the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, April 2010) (the ACHCRs); and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (September 2010) (the Code of Practice), in advance of a proposed development for the Queanbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW.

Navin Officer Heritage Consultants (NOHC) undertook Aboriginal community consultation in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010), with the results of the consultation presented in NOHC 2020 *Queanbeyan Palerang Regional Sport Complex, South Jerrabomberra Archaeological Assessment and Aboriginal Cultural Heritage Assessment*. Additional consultation is detailed in a supplementary report prepared by Apex Archaeology. This report builds on the results of the NOHC Aboriginal Cultural Heritage Assessment (ACHA), and presents the results of the test excavations undertaken within the area identified as PAD1-South within the study area.

This report was produced in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, Sept 2010) (Code of Practice) and the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, April 2010) (Consultation Guidelines). This Archaeological Test Excavation Report (ATER) has been produced in accordance with the Code of Practice.

The archaeological investigation was also completed with reference to the guideline *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, April 2011).

1.1 Study Area and Project Brief

The study area comprises Lot 1 DP 313299 and Lot 6 DP 239080. It is proposed to construct a regional sporting hub which would provide a sporting centre of excellence servicing Queanbeyan and the wider southern tablelands, along with associated carparking, infrastructure and landscaping within the area.

The study area is located along the border of NSW and the ACT and is approximately 250km south west of Sydney. It is located within the QPRC Local Government Area (LGA). The study area comprises approximately 24ha in total.

1.2 Purpose of the Archaeological Investigation

The purpose of the archaeological investigation of the site was to determine whether or not the study area contained Aboriginal cultural heritage values. Specifically, this report details the results of the archaeological test excavation, which was conducted to determine the nature and extent of archaeological deposits which may be present within the area identified as PAD.

This report builds on the results of the NOHC ACHA, and presents the results of the test excavations undertaken within the area identified as PAD within the proposed sports complex site.

1.3 Project Proponent

The proponent for the project is QPRC, who are also the landowners of the study area.

1.4 Investigators and Contributors

This archaeological assessment was commissioned and funded by QPRC. Apex Archaeology thanks Gayle Carey, Tim Geyer and Debbie Sibbick of QPRC for their assistance with the project. Thanks are also extended to the registered Aboriginal groups for their participation and assistance with the project, and to NOHC for their work in preparing the initial ACHA.

This report has been prepared by Leigh Bate, Director and Archaeologist with Apex Archaeology. The report was reviewed by Jenni Bate, Director and Archaeologist with Apex Archaeology. Both Jenni and Leigh have over thirteen years of archaeological consulting experience within NSW. Project team roles and qualifications are shown in Table 1.

Table 1: Project team roles and qualifications

Name	Role	Qualifications
Leigh Bate	Primary Report Author; Excavation Director; GIS	B.Archaeology; Grad. Dip. Arch; Dip. GIS
Jenni Bate	Project Manager; Review	B.Archaeology; Grad. Dip. CHM
Jason Barr	Field Archaeologist	
Corey O'Driscoll	Field Archaeologist	

Additionally, a number of RAPs participated in the test excavation program. Thanks go to:

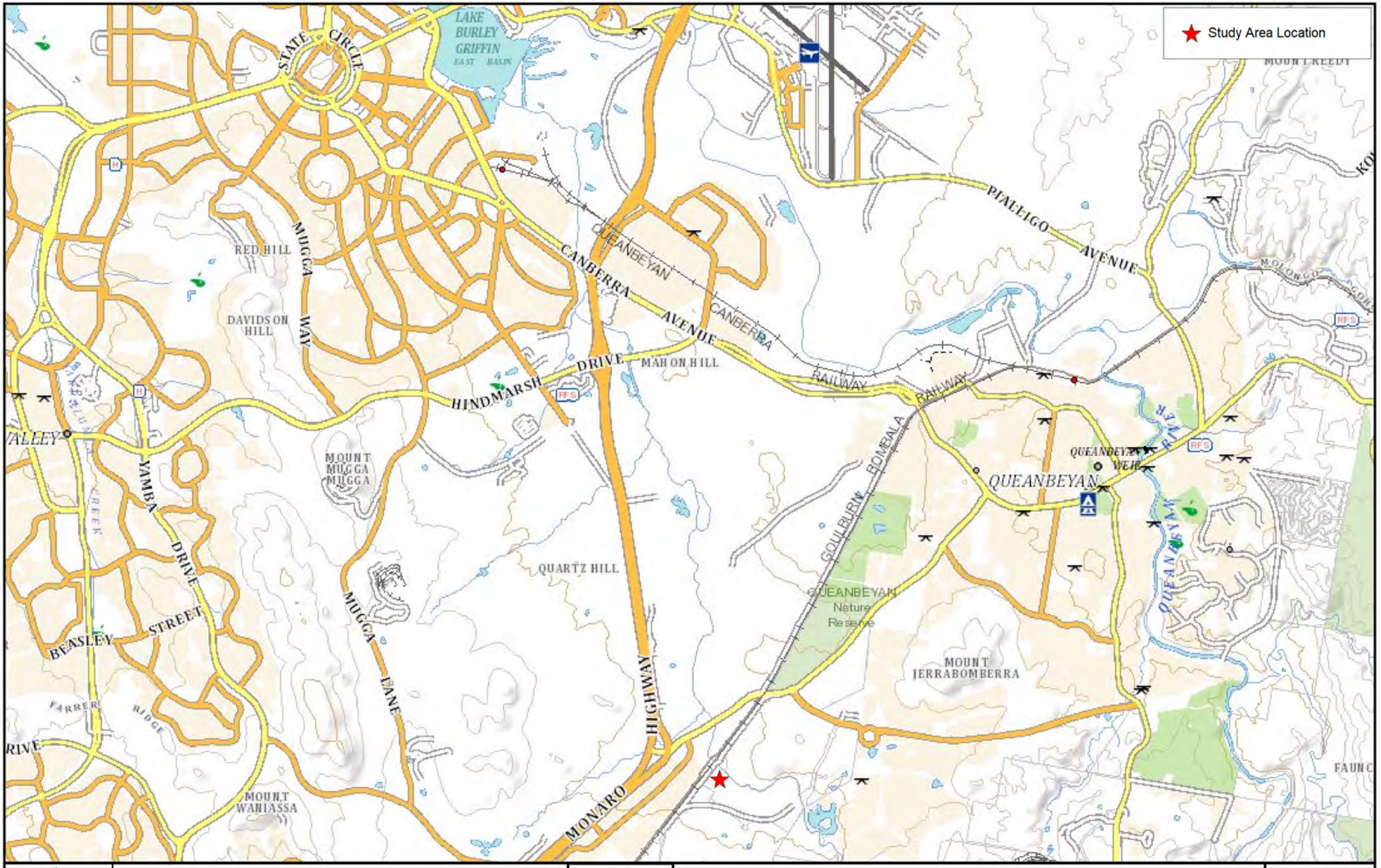
- Tyrone Bell, Thunderstone Aboriginal Cultural Services Pty Ltd
- Daniel Williams, Ngambri Local Aboriginal Land Council
- Sonione Rogers, Ngambri Local Aboriginal Land Council
- Aaron Williams, Ngambri Local Aboriginal Land Council

1.5 LIMITATIONS

This report is based on previously recorded archaeological and environmental information for the study area and wider region. This includes information from AHIMS, which is acknowledged to be occasionally inaccurate, due to inaccuracies in recording methods. No independent verification of the results of external reports has been made as part of this report.

This report builds on the information contained within the NOHC 2020 ACHA prepared for the project. No additional detailed research regarding site formation processes or land use history for the study area has been undertaken for the project as the NOHC assessment has been assumed to be accurate.

Field investigations for this report included test excavation in accordance with the Code of Practice. The results are considered to be indicative of the nature and extent of Aboriginal archaeological remains within the upper units of the study area, but it should be noted that further Aboriginal objects and sites which have not been identified as part of this assessment may be present within the deeper deposits of the study area, and further investigation of these deposits is required under an Aboriginal Heritage Impact Permit (AHIP).



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Projection:
MGA Zone 55 (GDA 94)
Base Map:
SixMaps Topo
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Figure 1: General location of the proposed development in its regional context

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Figure 2: Proposed layout of the QPRC Regional Sport Complex Site

2.0 Statutory Context

Heritage in Australia, including both Aboriginal and non-Aboriginal heritage, is protected and managed under several different Acts. The following section presents a summary of the applicable Acts which provide protection to cultural heritage within NSW.

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

This Act provides for the preservation and protection of injury and/or desecration of areas and objects in Australia and its waters that are of significance to Aboriginal people, in accordance with Aboriginal tradition.

Under this Act, the responsible Minister has provision to make both temporary and/or long-term declarations, in order to provide protection to areas and objects which are at threat of injury or desecration. In some instances, this Act can override State or Territory provisions, or be invoked if State or Territory provisions are not enforced. An Aboriginal or Torres Strait Islander individual or organisation must invoke the Act.

No items within the study area are listed or protected under this Act.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides protection to environmental sites of national significance, including places with cultural heritage values that contribute to Australia's national identity. The Act aims to respect the role of Indigenous peoples in the conservation and ecologically sustainable use of Australia's biodiversity, and to enhance the protection and management of important natural and cultural places. Additionally, the Act is designed to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

The National Heritage List provides a listing of natural, historic and Indigenous places of outstanding significance to the nation, while the Commonwealth Heritage List details the Indigenous, historic and natural places owned or controlled by the Australian Government.

Under the EPBC Act, approvals are required if any action is proposed that will have (or is likely to have) a significant impact on the National Heritage values of a National Heritage place. Therefore, actions must be referred to the Australian Government Minister for the Environment and Heritage. A decision will be made as to whether the proposed action will have a significant impact on any matters of national significance.

A search of both the NHL and the CHL did not identify any items within the study area.

2.1.3 Native Title Act 1993

The *Native Title Act 1993*, as amended, provides protection and recognition for native title. Native title is recognised where the rights and interests of over land or waters where Aboriginal and Torres Strait Islander practiced traditional laws and customs prior to the arrival of European settlers, and where these traditional laws and customs have continued to be practiced.

The National Native Title Tribunal (NNTT) was established to mediate native title claims made under this Act. Three registers are maintained by the NNTT, as follows:

- National Native Title Register
- Register of Native Title Claims
- Register of Indigenous Land Use Agreements.

Searching the NNTT registers allows identification of potential Aboriginal stakeholders who may wish to participate in consultation.

A search of all three registers did not identify any Native Title holders or traditional owners within the study area.

2.2 New South Wales Legislation

2.2.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* provides protection for all Aboriginal objects and places within NSW. Aboriginal objects are defined as the material evidence of the Aboriginal occupation of NSW, while Aboriginal Places are defined as areas of cultural significance to the Aboriginal community. All Aboriginal objects are protected equally under the Act, regardless of their level of significance. Aboriginal Places are gazetted if the Minister is satisfied that the location was and/or is of special significance to Aboriginal people.

Following amendments to the NPW Act in 2010, approval to impact Aboriginal cultural heritage sites is only granted under a Section 90 AHIP, which is granted by Heritage NSW of the Department of Premier and Cabinet.

2.2.2 Environmental Planning & Assessment Act 1979

Under the EP&A Act, it is necessary to consider environmental impacts, including impact to cultural heritage, as part of the land use process. Local Environmental Plans (LEPs) and Development Control Plans (DCPs) are also required to be prepared by Local Government Areas (LGAs) in order to provide guidance on the applicable level of environmental assessment. LGAs are required to maintain a list of locally significant heritage items as part of their LEP.

Under the EP&A Act, Part 3 describes the planning instruments at both local and regional levels; Part 4 relates to development assessment and consent processes, and Part 5 refers to infrastructure and environmental impact assessment.

3.0 Aboriginal Consultation Process

Aboriginal consultation in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* was undertaken by Navin Officer Heritage Consultants for this project. Full details of the consultation are detailed in the Navin Officer Heritage Consultants *Queanbeyan Palerang Regional Sports Complex, South Jerrabomberra, Archaeological Assessment and Aboriginal Cultural Heritage Assessment,* August 2020.

3.1 Consultation Summary

Full details of the consultation undertaken with the Aboriginal community can be found in the NOHC report for the project. The following section summarises the consultation undertaken by NOHC.

- Letters sent to statutory bodies 18/2/2020
    - Response from DPIE (now Heritage NSW) 18/2/2020
    - Response from ORALRA 24/3/2020
- Advertisement placed in the *Queanbeyan Age* 10/3/2020
- Invitations to register an interest sent 3/3/2020
    - 17 registrations of interest received
- Methodology and cultural information request sent 2 April 2020
    - Four responses received
- Draft ACHA sent 22 July 2020.
    - One response received.

Subsequent to the finalisation of the NOHC report and the test excavation program, a copy of the draft ATER was provided to the RAPs for their review and comment.

Three responses were received from the RAPs, all of which were supportive of the recommendations made. These are attached in Appendix A.

Table 2: Stakeholder comments and Apex Archaeology response

Stakeholder	Comment	Apex Archaeology response
MBM	Email stating "I have read the project information and draft test excavation for the above project, I endorse the recommendations made".	Noted with thanks
Muragadi	Email stating "I have read the project information and methodology for the above project, I agree with the recommendations made".	Noted with thanks
Clive Freeman	Email received stating "...as I couldn't take part in this excavation for this project (covid) and also it being my policy not to make comment on any project which I've not had a hands-on involvement with, I have no issues with the report or it's commentary, which were comprehensive and clear."	Noted with thanks

4.0 Landscape Context

An assessment of landscape features is required to assist in determining whether Aboriginal objects are likely to be present within the proposed activity area. Certain landscape features are more likely to have been utilised by Aboriginal people in the past and therefore are more likely to have retained archaeological evidence of this use. Focal areas of activity for Aboriginal people include rockshelters, sand dunes, water courses, waterholes and wetlands, as well as ridge lines for travel routes.

The presence of specific raw materials for artefact manufacture, as well as soil fertility levels to support vegetation resources, are also factors to be considered in the assessment of the environmental context of a study area. Geomorphological factors, such as erosion and accretion of soils, affect the preservation of potential archaeological deposits and therefore need to be considered when making an assessment of the potential for archaeological material to be present within a study area.

Please see Section 2 of the NOHC 2020 ACHA for further information regarding this section.

5.0 Archaeological Context

An analysis of previous archaeological work within the study area assists in the preparation of predictive models for the area, through understanding what has been found previously. By compiling, analysing and synthesising the previous archaeological work, an indication of the nature and range of the material traces of Aboriginal land use is developed. An understanding of the context in which the archaeological assessment is made is vital, as development does not occur within a vacuum, but within a wider cultural landscape, and this must be considered during any archaeological assessment in order to develop appropriate mitigation and management recommendations.

5.1 AHIMS Results

NOHC undertook a search of the AHIMS register on 19 March 2020. A total of 15 registered Aboriginal heritage sites were identified within the search area, comprising three PADs, five artefact sites with associated PAD and seven artefact sites. One of the sites PAD1-South (#57-2-0975) was located within the development area.

Please see Section 5.2.3 of the NOHC 2020 ACHA for further information.

5.2 Previous Archaeological Research

NOHC 2020 presents a summary of previous archaeological research within the immediate region. Please see Section 5 of the NOHC Archaeological Assessment for further information.

5.2.1 Hughes et al 2007

NOHC 2020 provide a brief description of the work undertaken by Hughes et al 2007 in their review of previously completed works in the general region. A more detailed review of this report is included here, as requested by HNSW.

Hughes, Richardson and Shawcross undertook monitoring of ground disturbance of the proposed Hume Resource Recovery Estate in the ACT, located approximately 1.8km west of the current study area and adjacent to Dog Trap Creek (Figure 3). Two sites had been previously identified and management recommendations included monitoring of any ground disturbance work by Aboriginal representatives and consulting archaeologists to salvage any artefacts uncovered.

Earth stripping works were monitored in 2005, with a grader used to “systematically scrape away the potentially artefact-bearing topsoil over the two sites” (Hughes et al 2007). The grader scrapes occurred to a maximum depth of 500mm or when the scrapes reached weathered bedrock. 285 artefacts were collected at one site, with 458 artefacts recovered from the other. The peak concentration of artefacts was located at 100-150mm depth below the original surface, and at a maximum depth of approximately 400mm.

Artefacts recovered included flakes, retouched flakes, cores, hammerstones, anvils, ground stone and flaked pieces, and non-local stone was brought in as manuports. Artefacts were formed on chert, fine and medium grained silicious materials, hornfels, quartz, quartzite, silcrete, and volcanic materials.

It was concluded that grader scrapes alone are "an inappropriate archaeological salvage strategy" (Hughes et al 2007) and that if used, should only occur in conjunction with systematic excavations, including sieving of materials. The remainder of the areas not subject to grader scrapes were considered highly likely to contain archaeological evidence and were recommended to be protected in future, or archaeological excavations undertaken prior to any impact occurring.

5.2.1 Site Dating

The majority of archaeological dates obtained for Aboriginal sites in the ACT and surrounds focus on the 'high country' – ie the mountain ranges of southeast Australia. These areas demonstrate that Aboriginal people have inhabited the high-altitude regions for thousands of years, with some dates of up to 25,000 years for occupation (Flood et al 1987). However, most of these dated sites comprise rockshelter sites, which are a different context to the current study area being open country; and the majority of dates obtained in the last few decades point to occupation peaking around 5,500 to 5,000 years BP (Theden-Ringl 2016:40).

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MGA Zone 55 (GDA 94)
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Figure 3: PAD 1 South in relation to Hughes et al. 2007

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5.3 Environmental Context

NOHC 2020 presents an environmental context for the study area. Please see Section 2.3 of the NOHC Archaeological assessment for further information.

In addition, Apex Archaeology have included the following information regarding Aboriginal use of lithic material within an area.

5.3.1 Raw Materials

A wide range of raw materials were selected by Aboriginal people for flaking to create stone implements. Material types ranged from high quality to poor quality for flaking purposes, depending on the geology of the area and readily available material types. The following is a description of a range of raw material types known to have been utilised by Aboriginal people for the creation of stone artefacts.

Breccia

Breccias are coarse, angular volcanic fragments cemented together by a finer grained tuffaceous matrix.

Chalcedony

Chalcedony is a microcrystalline, siliceous rock which is very smooth and can be glossy. Introduction of impurities can produce different coloured versions of chalcedony, including yellow/brown (referred to as carnelian), brown (sard), jasper (red/burgundy) and multicoloured agate. It flakes with a sharp edge and was a prized material type for the creation of stone artefacts in parts of Australia (Kuskie & Kamminga 2000: 186).

Chert

Chert is a highly siliceous sedimentary rock, formed in marine sediments and also found within nodules of limestone. Accumulation of substances such as iron oxide during the formation process often results in banded materials with strong colours. Chert is found in the Illawarra Coal Measures and also as pebbles and colluvial gravels. It flakes with durable, sharp edges and can range in colour from cream to red to brown and grey.

Petrified Wood

Petrified wood is formed following burial of dead wood by sediment and the original wood being replaced by silica. Petrified wood is a type of chert and is a brown and grey banded rock and fractures irregularly along the original grain.

Quartz

Pure quartz is formed of silicon dioxide, and has a glossy texture and is translucent. Introduction of traces of minerals can lead to colouration of the quartz, such as pink, grey or yellow. The crystalline nature of quartz allows for minute vacuoles to fill with gas or liquid, giving the material a milky appearance.

Often quartz exhibits internal flaws which can affect the flaking quality of the material, meaning that in general it is a low-quality flaking material (Kuskie & Kamminga 2000: 186). However, quartz is an abundant and widely available material type and therefore is one of the most common raw materials used for artefact manufacture in Australia. Flaking of quartz can produce small, very sharp flakes which can be used for activities such as cutting plant materials, butchering and skinning.

QUARTZITE

Formed from sandstone, quartzite is a metamorphic stone high in silica that has been heated or had silica infiltrate the voids found between the sand grains. Quartzite ranges in colour from grey to yellow and brown.

SILCRETE

Silcrete is a siliceous material formed by the cementing of quartz clasts with a matrix. These clasts may be very fine grained to quite large. It ranges in colour from grey to white, brown, red or yellow. Silcrete flakes with sharp edges and is quite durable, making silcrete suitable for use in heavy duty woodworking activities and also for spear barbs (Kuskie & Kamminga 2000:184).

TUFF/INDURATED MUDSTONE

There is some disagreement relating to the identification of lithic materials as tuff or indurated mudstone. The material is a finely textured, very hard yellow/orange/reddish-brown or grey rock. Kuskie and Kamminga (2000: 6, 180) describe that identification of lithic materials followed the classification developed by Hughes (1984), with indurated mudstone described as a common stone material in the area. However, Kuskie and Kamminga's analysis, which included x-ray diffraction, identified that lithics identified as 'indurated mudstone' was actually rhyolitic tuff, with significant differences in mineral composition and fracture mechanics between the stone types. They define mudstone as rocks formed from more than 50% clay and silt with very fine grain sizes and then hardened.

The lithification of these mudstones results in shale (Kuskie & Kamminga 2000: 181) and thus 'indurated mudstone', in the opinion of Kuskie and Kamminga, do not produce stones with the properties required for lithic manufacture.

In 2011, Hughes, Hiscock and Watchman undertook an assessment of the different types of stones to determine whether tuff or indurated mudstone is the most appropriate terminology for describing this lithic material. The authors undertook thin section studies of a number of rocks and determined that the term 'indurated mudstone' is appropriate, with an acknowledgment that some of this material may have been volcanic in origin. They also acknowledge that precise interpretation of the differences between material types is difficult without detailed petrological examination, and suggest that artefacts produced on this material are labelled as 'IMT' or 'indurated mudstone/tuff'.

5.3.2 Procurement

Assemblage characteristics are related to and dependent on the distance of the knapping site from raw materials for artefact manufacture, and different material types were better suited for certain tasks than other material types. Considerations such as social or territorial limitations or restrictions on access to raw material sources, movement of groups across the landscape and knowledge of source locations can influence the procurement behaviour of Aboriginal people. Raw materials may also have been used for trade or special exchange between different tribes.

5.3.3 Manufacture

A range of methodologies were used in the manufacture of stone artefacts and tools, through the reduction of a stone source. Stone may have been sourced from river gravels, rock outcrops, or opportunistic cobble selection. Hiscock (1988:36-40) suggests artefact manufacture comprises six stages, as follows:

1. The initial reduction of a selected stone material may have occurred at the initial source location, or once the stone had been transported to the site.
2. The initial reduction phase produced large flakes which were relatively thick and contained high percentages of cortex. Generally the blows were struck by direct percussion and would often take advantage of prominent natural ridges in the source material.
3. Some of these initial flakes would be selected for further reduction. Generally only larger flakes with a weight greater than 13-15 grams would be selected for further flaking activities.
4. Beginning of 'tranchet reduction', whereby the ventral surface of a larger flake was struck to remove smaller flakes from the dorsal surface, with this retouch applied to the lateral margins to create potential platforms, and to the distal and proximal ends to create ridges and remove any unwanted mass. These steps were alternated during further reduction of the flake.
5. Flakes were selected for further working in the form of backing.
6. Suitable flakes such as microblades were retouched along a thick margin opposite the chord to create a backed blade.

Hiscock (1986) proposed that working of stone materials followed a production line style of working, with initial reduction of cores to produce large flakes, followed by heat treatment of suitable flakes before the commencement of tranchet reduction. These steps did not necessarily have to occur at the same physical location, but instead may have been undertaken as the opportunity presented.

5.4 Predictive Model

Based on the results of previous archaeological investigations within the wider region, a number of predictions regarding Aboriginal use of the area can be made. These predictions focus on the nature, extent and integrity of the remaining evidence.

NOHC 2020 present a predictive model for Aboriginal occupation of the area in Section 2.4 of their report.

In general, the study area was considered likely to have provided a potential occupation site for Aboriginal people in the past, due to the proximity of water, presence of stone materials, and topography.

6.0 Field Work

Survey and site assessment were undertaken by NOHC in May 2020. Please see Section 7 of the NOHC 2020 ACHA.

In summary, the site survey identified one new Aboriginal site known as South Jerrabomberra 01 (SJ01), comprising two quartz artefacts. The boundaries of an existing site, PAD1-South (AHIMS #57-2-0975), were refined as a result of the survey.

6.1 Test Excavation Results

The NOHC ACHA completed for the project had noted the potential for subsurface archaeological deposits to be present within the study area, based on landform analysis and the presence of a higher order watercourse (Jerrabomberra Creek) within close proximity of the site. The survey undertaken as part of the ACHA process confirmed the potential for subsurface deposits to be present within portions of the site and therefore test excavations to investigate the nature and extent of these deposits were recommended. As such, Apex Archaeology was engaged to undertake the test excavation of the PAD identified within the study area. Test excavation of the site commenced on Monday 28 September and was completed on Friday 9 October 2020.

Notification of the commencement of test excavations was provided to HNSW on 2 September 2020, 14 days prior to the proposed start date of 28 September 2020. This was in accordance with Requirement 15c of the Code of Practice.

A total of 64 50cm x 50cm test excavation units were excavated within the study area, as shown on Figure 3. All test pits were excavated in 5cm spits.

One of the 50cm x 50cm units was expanded to 1m^2 by the excavation of an additional three contiguous 50cm x 50cm units, forming four quadrants of a 1m^2 test pit. The test pit selected for expansion was the only pit containing an item initially assumed to be artefactual material; however subsequent analysis identified the item as non-artefactual. No other cultural material was identified within any of the expansion pits.

Thirteen of the test pits were placed outside of the PAD as delineated by NOHC. It is unclear why the specific delineation of the PAD boundary was made, as the landform on either side of the internal access track was no different visually. This placement was to determine both presence and absence of archaeological material, should it be present within the area.

All excavated material was sieved through 5mm aperture mesh table sieves. No cultural lithics were identified during the excavation.

Test pits were excavated to a maximum depth of 80cm. Some pits contained evidence of subsurface disturbance, in the form of fill. The remainder were all culturally sterile with increasing levels of clay content throughout the site.

Pit Name	End Depth	Description	Pictures
TP1	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark reddish brown with increasing clay content/plasticity.	
TP2	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark reddish brown with increasing clay content/plasticity.	
TP3	55cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP4	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP5	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP6	80cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Distinct horizonal change around 60cm. Base was a dark grey/black with increasing clay content/plasticity.	
TP7	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP8	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP9	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP10	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP11	51cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP12	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP13	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP14	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP15	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP16	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP17	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP18	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP19	35cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP20	45cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP21	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP22	35cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP23	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP24	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP25	35cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP26	35cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP27	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP28	60cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP29	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP30	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP31	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP32	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP33	13cm	Dark brown silty loam transitions quickly to mottled clay. Shallow deposit base reached at 13cm. Yellow/grey clay base.	
TP34	49cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP35	42cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP36	45cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP37	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP38	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP39	42cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP40	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP41	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP42	37cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP43	15cm	Brown silty loam transitions quickly to mottled clay. Shallow deposit base reached at 13cm. Yellow/grey clay base.	
TP44	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP45	35cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP46	20cm	Shallow silty brown topsoil overlying clay fill. TP disturbed. Location near to access track within the raceway car park.	
TP47	10cm	Shallow silty brown topsoil overlying clay fill. TP disturbed. Location near to access track within the raceway car park.	
TP48	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP49	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP50	45cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

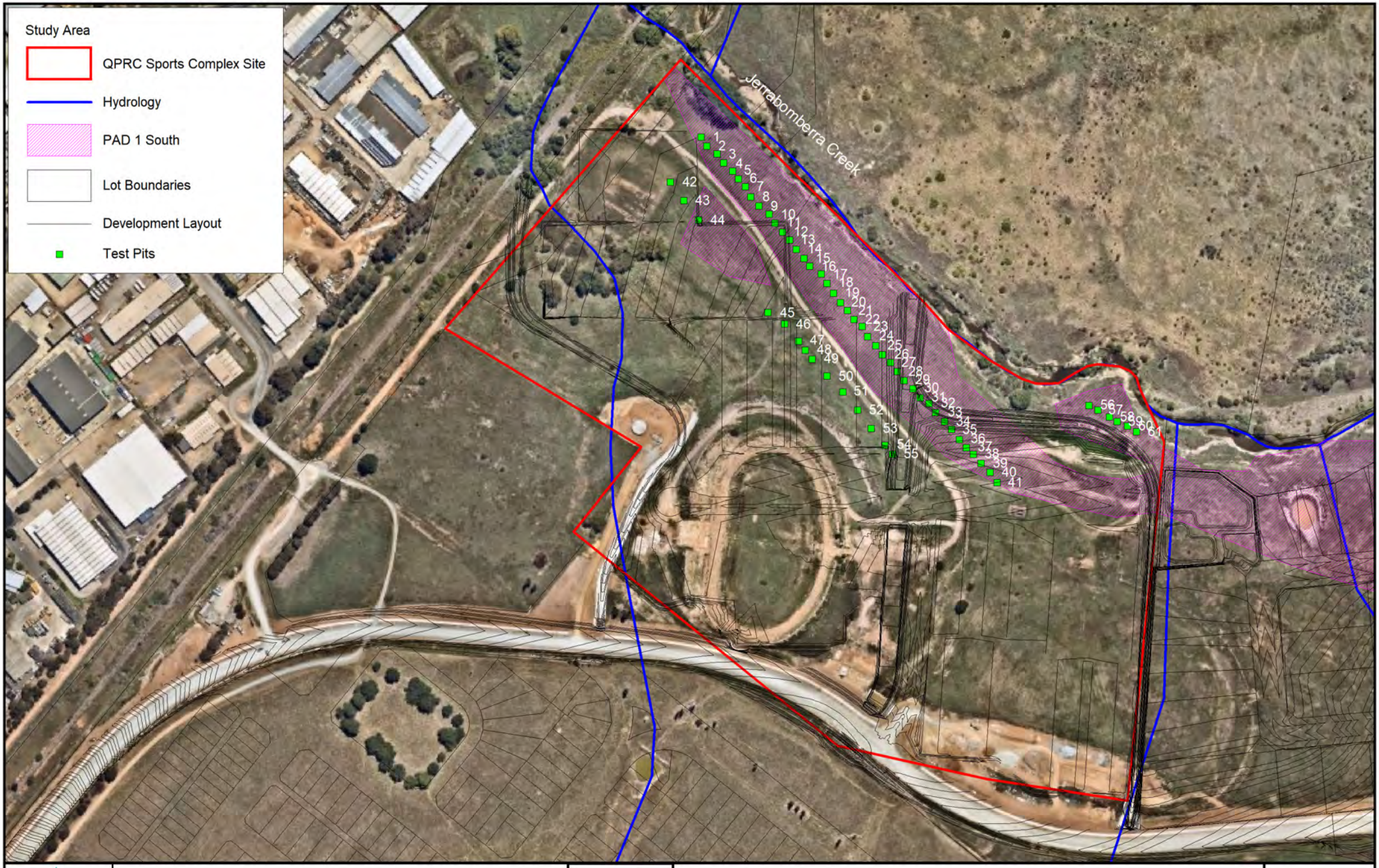
Pit Name	End Depth	Description	Pictures
TP51	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP52	40cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP53	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP54	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP55	30cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP56	70cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP57	70cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP58	60cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP59	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP60	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	

Pit Name	End Depth	Description	Pictures
TP61	50cm	Brown silty loam, fine gravels within, overlying a coarse mixing of silty gravel and sand. Base was a dark grey/black with increasing clay content/plasticity.	
TP62-64	TP32 – 50cm TP62-64 25cm	Expansion of TP 32 into 1m² (additional 3 50 x50cm squares). Expansion was undertaken due to an item being identified in spit 2 of TP 32. Subsequent analysis has determined the item was not culturally modified thus not artefactual.	

Table 3: GPS coordinates for test pits

Test Pit #	Easting	Northing
1	697901	6081939
2	697906	6081931
3	697915	6081924
4	697921	6081916
5	697929	6081909
6	697934	6081902
7	697940	6081895
8	697945	6081886
9	697952	6081878
10	697961	6081871
11	697966	6081863
12	697973	6081855
13	697979	6081848
14	697985	6081840
15	697992	6081832
16	697997	6081825
17	698007	6081818
18	698012	6081810
19	698018	6081801
20	698024	6081793
21	698030	6081786
22	698036	6081778
23	698043	6081772
24	698048	6081763
25	698055	6081755
26	698061	6081747
27	698068	6081740
28	698074	6081732
29	698080	6081724
30	698088	6081717
31	698094	6081709
32	698102	6081704
33	698108	6081696
34	698116	6081688
35	698122	6081681
36	698129	6081672
37	698135	6081665
38	698141	6081659
39	698148	6081651
40	698156	6081643
41	698162	6081634
42	697874	6081899
43	697886	6081883
44	697899	6081866
45	697960	6081784
46	697975	6081774
47	697987	6081759
48	697993	6081751
49	697999	6081743
50	698012	6081728
51	698026	6081714
52	698039	6081698
53	698051	6081682
54	698063	6081667
55	698070	6081659
56	698243	6081702
57	698251	6081698
58	698261	6081692
59	698268	6081688
60	698277	6081684
61	698285	6081679



PO Box 236
NOWRA
NEW SOUTH WALES 2541

0 125 250
metres

Projection:
MGA Zone 55 (GDA 94)
Base Map:
Nearmap 2021
Image Date:07/02/2021
Final - Version 1

Figure 4: Test pit layout showing PAD area (PAD1-South).

N

6.2 Discussion

The test excavation confirmed that no subsurface archaeological material was present in the area defined as PAD within the study area. None of the test or expanded pits contained artefactual material.

Results from the 13 test pits placed outside of the PAD boundaries were almost identical to the results from the remaining 48 test pits within the PAD boundaries. The only outliers were test pit 46 and 47 which encountered fill/disturbance relating to the internal raceway access track. As shown on Figure 4 of the ATER, test pits were undertaken within the PAD area. Some test pits fell outside of the area designated as PAD but were within the development footprint. This occurred as the landform was visually homogenous across the study area in close proximity to the creek, and the decision was made on site to alter the transect locations slightly to ensure an appropriate sample of the potential archaeological deposit was made.

Given the majority of the proposed impacts would not exceed a depth of 1m in the areas tested as a part of this program, and the culturally sterile layers identified throughout the PAD1-South area on completion of the test excavation program, it is considered unlikely that the proposed development will impact on cultural material. However, given the possibility raised by NOHC of deep cultural deposits occurring at depths greater than 4-5m, geomorphological assessment of the study area was undertaken by Geoprospection (Player 2021). The results of this investigation are discussed in Section 6.3 and the report is attached as Appendix C.

The geomorphological assessment identified that the study area had been formed through both fluvial and alluvial processes, and due to the nature of these processes, fluvial stratigraphic units were unlikely to contain evidence of Aboriginal occupation, while alluvial units retain the potential for evidence of Aboriginal occupation to be present. This is further discussed in Section 6.3.

Test pits were excavated to a maximum of 80cm depth due to safety considerations as 50 x 50cm test pits cannot safely be excavated to a greater depth, and the sterility of all spits excavated across the study area did not justify expanding test pits to 1m^2. The potential for further deposits is proposed to be explored through the use of machine auguring under an approved AHIP. The methodology approved by the RAPs and provided by NOHC 2020 for the project, which was followed for the test excavations, did not make provision for the investigation of these deeper deposits.

Further, the NOHC methodology stated “Excavation will cease according to an on-site appreciation of the vertical extent of the archaeological deposit”. All test pits were culturally sterile, and excavation ceased on reaching an appropriate context in the opinion of the archaeologist on site. This was also based on the results of other archaeological investigations within the wider area (such as Hughes et al 2007) where all archaeological evidence was in the uppermost 30-40cm of deposit.

Site SJ01 was relocated and reassessed as part of the test excavation program. The site was located in a disturbed area within the western portion of the study area. There were a number of large quartz cobbles within and around a spoil heap and a number of smaller angular quartz fragments in a disturbed context as a result of bulldozing activity to form a carpark located directly north of the area. The site is considered to be machine impacted quartz material in a highly disturbed context. This site has not been listed on the AHIMS register by the archaeologist who identified the site. As the area is not considered to contain archaeological material, the site should not be registered on AHIMS, and is not considered to have potential for archaeological or cultural material to be present. As the site has not been registered, no ASIRF has been submitted to the AHIMS registrar.

This site differs considerably from the results obtained by Hughes et al (2007) at the Hume Resource Recovery Centre, despite the relatively close proximity and general similarity of context between the sites. Hughes et al (2007) identified a relatively dense artefact concentration within the site, including a range of artefact and raw material sites. PAD 1 – South did not contain any surface expressions of artefactual material and no subsurface artefacts were recovered from the top 80cm of deposit. NOHC (2020) suggest that Dog Trap Creek may have been a greater focus of occupation due to the more protected location than that at Jerrabomberra Creek. There may be evidence within the deeper deposits and further comparisons can be made on completion of further investigations.

6.3 Additional Geomorphological Assessment

Subsequent to the completion of the test excavation program, the ACHA report was finalised and submitted to Heritage NSW (HNSW) to support the project approval. HNSW subsequently requested additional clarification regarding the deep deposits identified by NOHC along Jerrabomberra Creek and a geomorphologist, Dr Sam Player, was engaged by Apex Archaeology to assist in an assessment of the site formation processes present within the study area. Dr Player identified the landscape as formed by a combination of fluvial (deposited by water) and alluvial (accumulation in situ) processes, with the potential for buried land surfaces to be present. These land surfaces may have been the focus of Aboriginal occupation in the past.

In order to investigate the potential age of these buried land surfaces, a sample was taken from the clearly discernible back swamp layer visible in the creek bank section, at approximately 80cm depth. This sample was sent to the University of Waikato for radiocarbon dating. Accelerator Mass Spectrometry (AMS) was utilised to obtain a date of 2421±13 BP.

As Aboriginal occupation of the wider region is known to date from at least 5000 years ago, and up to 25,000 years ago, this date suggests land surfaces existed at a time when the area may have been utilised by Aboriginal people in the past. Additionally, as the project includes impact to a depth greater than the 80cm which

has been investigated as part of this project, further investigation will be required to define the nature and extent of any deposits which may be present at a greater depth.

The geomorphological assessment undertaken by Dr Player assessed that it is “feasible to discount much of the subsurface materials as viable archaeological context based on whether they were formed under fluvial or alluvial conditions. Under fluvial conditions, sediments would be deposited directly within the stream channel, which can fairly be regarded as uninhabitable. Alternatively, while the sediments would be deposited during flood events, under alluvial conditions the location would be more often dry and inhabitable. It is therefore reasonable to exclude fluvial stratigraphic units from any further examination” (Player 2021). Further, Dr Player states “the floodplain materials deeper than the base of recent test excavations (Apex Archaeology 2021) are viable as Aboriginal archaeological context. The depth at which the materials become unviable is unknown, although units with a fluvial origin can be discounted” (Player 2021).

7.0 Aboriginal Cultural Heritage Significance Assessment

7.1 Introduction

The *Aboriginal cultural heritage consultation requirements for proponents 2010* acknowledge that:

- Aboriginal people have the right to maintain their culture, language, knowledge and identity
- Aboriginal people have the right to directly participate in matters that may affect their heritage
- Aboriginal people are the primary determinants of the cultural significance of their heritage

Undertaking consultation with Aboriginal people ensures that potential harm to Aboriginal objects and places from proposed developments is identified and mitigation measures developed early in the planning process.

7.2 Criteria

The Burra Charter is considered an appropriate framework for the assessment of cultural heritage, which can be made based on the following assessment criteria:

- **Social value:** Also referred to as cultural value, this criterion considers the spiritual, traditional, historical or contemporary associations an area or place has for Aboriginal people
- **Historic value:** the relationship between a place and people, events, phases or activities of importance to the Aboriginal community
- **Scientific value:** assessment under this criterion considered the ability of a landscape, place, area or object to inform scientific research and/or analysis and to assist in answering research questions
- **Aesthetic value:** the ability of a place, area, landscape or object to demonstrate aesthetic characteristics, or possess creative or technical values
- **Representativeness:** this criterion examines if the item is a representative example of that site type, and if it possesses the main characteristics of that site type
- **Rarity:** assesses whether the site is uncommon or endangered within a region and to what extent that site type is found elsewhere

Additionally, archaeological significance is assessed based on the archaeological or scientific values of an area. These values can be defined as the importance of the area relating to several criteria. Criteria used for determining the archaeological significance of an area are as follows:

- **Research potential:** Can the site contribute to an understanding of the area/region and/or the state's natural and cultural history? Is the site able to provide information that no other site or resource is able to do?

- **Representativeness:** is the site representative of this type of site? Is there variability both inside and outside the study area? Are similar site types conserved?
- **Rarity:** is the subject area a rare site type? Does it contain rare archaeological material or demonstrate cultural activities that no other site can demonstrate? Is this type of site in danger of being lost?
- **Integrity/Intactness:** Has the site been subject to significant disturbance? Is the site likely to contain deposits which may possess intact stratigraphy?

Further, an assessment of the grade of significance is made, based on how well the item fulfils the assessment criteria. The Heritage Branch of the Department of Planning (now the Heritage Division of the Department of Planning, Industry and Environment) 2009 guideline *Assessing Significance for Historical Archaeological Sites and 'Relics'* defines the grading of significance as follows:

Table 4: Grading of significance, from Heritage Branch 2009

Grading	Justification
Exceptional	Rare or outstanding item of local or State significance. High degree of intactness. Item can be interpreted relatively easily.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alternations do not detract from significance.
Moderate	Altered or modified elements. Elements with little heritage value but which contribute to the overall significance of the item.
Little	Alterations detract from significance. Difficult to interpret.
Intrusive	Damaging to the item's heritage significance.

Whilst this was developed for the assessment of significance of historical items, the criteria are applicable to Aboriginal significance assessments as well. It is important to note that the below assessment is specific to Aboriginal cultural heritage and does not consider the non-Aboriginal significance of the site.

7.3 Significance Assessment

NOHC undertook a significance assessment (Section 9.1) as part of preparing the ACHA for the project.

7.3.1 Cultural Values Identified

The study area was considered by NOHC to have significance under historic, scientific/archaeological, and social/cultural values. The site was considered to have minimal aesthetic value.

Specifically, NOHC considered site SJ01 to have low scientific value, and PAD1-South to have high potential to contain subsurface archaeological material, with the scientific significance to be refined on completion of test excavations.

7.3.2 Revised Significance Assessment

Further examination of Site SJ01 identified the site to be machine impacted quartz pieces rather than culturally modified artefactual material. Therefore, this site is not considered to be an archaeological site and it is not considered to hold archaeological or scientific significance.

PAD1-South was not identified to contain cultural material and therefore is not considered to hold archaeological or scientific significance within the top 80cm of deposit. However, there is potential for Aboriginal occupation of deeper deposits which will be investigated under an AHIP.

The archaeological significance of the site will be revised on completion of the further investigations.

It is acknowledged that Aboriginal people have intangible as well as tangible links to places, and the lack of physical evidence may not necessarily remove the significance of an area to the Aboriginal people who once inhabited it. It is also acknowledged that if archaeological deposits are identified at depth, it is likely that these will be quite old, and thus significant under multiple criteria. To date, no comments regarding the cultural heritage significance of the specific study area have been received from the RAPs, and comments received from the RAPs indicated their satisfaction with the report and its recommendations.

8.0 Impact Assessment

8.1 Proposed Development

Queanbeyan-Palerang Regional Sports Complex is a new regional sporting hub designed to bridge the gaps in sports provision, delivering higher levels of sports opportunities and increasing participation at all levels.

Phase one will provide a centre of excellence for football (soccer) to W-League standard, and service the National Premier League and National Youth League. Four soccer fields will be built, two of which will be FIFA certified synthetic fields and two will be natural turf fields suitable for pre-elite level games and training. Two first-grade hockey fields suitable for hosting national, state and first grade competitions will be Federation of International Hockey certified. The fields will service these rapidly growing sports and allow for high level night competition as well as development clinics and sporting events such as the Kanga Cup. Phase one will also include one major pavilion and two minor pavilions, spectator and player amenities, lighting, access and carparking for approximately 234 vehicles along with parking for coaches.

Phase two will include a Multi-Purpose Sports Stadium suitable for a variety of indoor sports including but not limited to basketball, netball, hockey and futsal. The Stadium will double as a venue for concerts, conferences/expos, training & workshops, networking/corporate functions, festivals/fairs etc as well for rehabilitation therapy. It will include additional carparking for approximately 100 vehicles, coach parking, internal roads, paths, landscaping/plaza and all infrastructure required to service the stadium.

Infrastructure would include installation of stormwater drainage to a maximum of 3.5m depth. Levelling across the remainder of the site would include both cutting and filling to a maximum depth of 80cm. Deep disturbances across the site would be limited to the area of the stormwater drainage adjacent to the creekline.

8.2 Potential Impact

One previously registered site is located within the study area, comprising an area of PAD. Test excavations within this area did not identify any cultural material within the top 80cm of deposit. However, potential for deeper deposits within alluvial contexts at depth exists, and this must be investigated under an approved AHIP.

A second site, SJ01, was identified by NOHC during the site inspection undertaken for the project. Further assessment of this site has identified that the quartz items have been subject to machine impact, and are not culturally modified. This site has not been registered with AHIMS and thus no further action is required with relation to this site.

Further investigation of the deep deposits of PAD 1-South is required to determine if the proposal will impact on Aboriginal cultural material, as the proposed stormwater drains fall within this area.

Construction of the proposed sports ground within the rest of the site would impact only to a maximum depth of 80cm, and this is considered unlikely to impact on any archaeological deposits.

9.0 Management, Mitigation and Recommendations

9.1 Guiding Principles

Wherever possible and practicable, it is preferred to avoid impact to Aboriginal archaeological sites. In situations where conservation is not possible or practicable, mitigation measures must be implemented.

The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013 (The Burra Charter) provides guidance for the management of culturally sensitive places. The Burra Charter is predominantly focussed on places of built heritage significance, but the principles are applicable to other places of significance as well.

The first guiding principle for management of culturally significant sites states that "places of cultural significance should be conserved" (Article 2.1). A cautious approach should be adopted, whereby only "as much as necessary but as little as possible" (Article 3.1) should be changed or impacted.

Mitigation measures depend on the significance assessment for the site. Cultural significance of sites should also be considered in consultation with the Aboriginal community during community consultation.

9.2 Harm avoidance or Mitigation

Portions of the study area were originally considered to have high archaeological potential. Through investigation of the potential archaeological deposit within this area, this has been refined to no archaeological significance for the upper 80cm of deposit.

Further geomorphological assessment of the site has identified the potential for deep alluvial deposits to be present within PAD 1 – South which may have been a focus of Aboriginal habitation in the past. Further investigation of these deposits is required under an AHIP, as the depth required to be investigated cannot be tested under the Code of Practice. A methodology for this further assessment has been prepared and is attached as Appendix B. Portions of PAD 1 – South adjacent to Jerrabomberra Creek are proposed to be impacted by the construction of required stormwater drainage.

Consultation with the Aboriginal community has been undertaken for this project in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010*. The Aboriginal community have been afforded an opportunity to provide feedback regarding the proposed development and its potential impact on Aboriginal cultural heritage, and their views have been incorporated into this final ACHA.

Additional mitigation measures can be proposed once the full nature and extent of deposits is understood following completion of machine auguring within the PAD area.

10.0 Permit Requirements

10.1 Permit Area

An application for an AHIP under Part 6 of the *National Parks and Wildlife Act 1974* is required for the Queanbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW prior to the commencement of the proposed development of the site. The study area is further defined as Lot 1 DP 313299 and Lot 6 DP 239080, and the proposed impact area is contained within these cadastral boundaries. Figure 5 shows the proposed AHIP boundary, and Table 4 lists the grid references for the proposed AHIP boundaries in GDA/MGA 94, Zone 56. These grid references are also provided on Figure 5.

Table 5: Grid references for AHIP boundary

Point	Easting	Northing
1	698,060.28	6,081,825.98
2	698,053.02	6,081,715.27
3	698,116.28	6,081,657.72
4	698,177.99	6,081,624.83
5	698,267.50	6,081,603.66
6	698,302.75	6,081,607.95
7	698,308.66	6,081,665.13
8	698,283.18	6,081,692.32
9	698,213.45	6,081,703.52

Point	Easting	Northing
10	698,219.39	6,081,679.02
11	698,300.74	6,081,649.81
12	698,296.67	6,081,641.84
13	698,278.26	6,081,637.32
14	698,238.44	6,081,641.17
15	698,209.58	6,081,654.28
16	698,127.46	6,081,727.94
17	698,118.75	6,081,769.86

The proposed AHIP boundary includes the area proposed for deep excavation for the construction of stormwater drainage which falls within site #57-2-0975.

10.2 Permit Type

The AHIP application requests an AHIP to permit machine auguring within the area proposed for stormwater drainage, as this cannot be undertaken under the Code of Practice due to the proposed methodology and the depth required. The methodology for the proposed machine auguring is attached as Appendix B.

It is understood that a second AHIP application would be required to permit harm to any archaeological material identified during the test excavations or to allow further salvage excavations, and appropriate reporting would be prepared to support that if required.

The remainder of the site does not contain cultural material and no AHIP is required to permit impact within the remainder of the site outside the AHIP application area, as shown on Figure 5.

10.3 AHIMS Numbers

One AHIMS site falls within the study area and would be impacted by the proposed development. This comprises deep potential deposits associated with site PAD1-South (AHIMS #57-2-0975), a potential archaeological deposit (PAD). Geomorphological assessment has identified potential for deep deposits to be present, although it is noted that there is no evidence of cultural material within the top 80cm of deposit.

10.4 Previous AHIPs

No AHIPs have been issued or refused previously for the study area to the best of our knowledge.

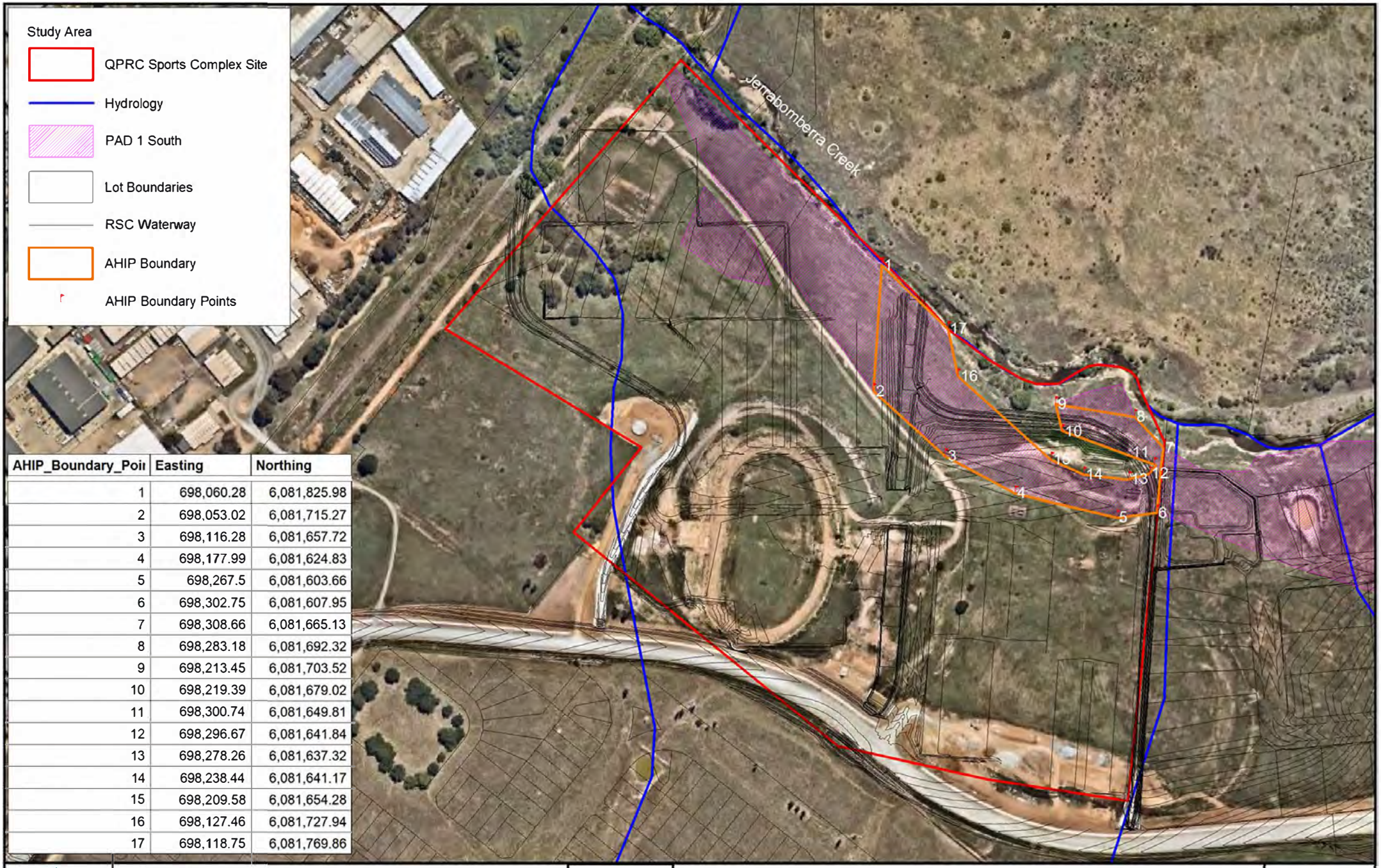
10.5 Restricted Information and Confidentiality

Aboriginal stakeholders for the project have not identified any restricted, confidential or culturally sensitive information related to the project and this AHIP application.

10.6 Copyright

10.7 Artefact Management

Any artefacts recovered during the proposed works should be reburied on site within an appropriate location that will not be further impacted. The location of these items would be registered with AHIMS.



AHIP_Boundary_Poi	Easting	Northing
1	698,060.28	6,081,825.98
2	698,053.02	6,081,715.27
3	698,116.28	6,081,657.72
4	698,177.99	6,081,624.83
5	698,267.5	6,081,603.66
6	698,302.75	6,081,607.95
7	698,308.66	6,081,665.13
8	698,283.18	6,081,692.32
9	698,213.45	6,081,703.52
10	698,219.39	6,081,679.02
11	698,300.74	6,081,649.81
12	698,296.67	6,081,641.84
13	698,278.26	6,081,637.32
14	698,238.44	6,081,641.17
15	698,209.58	6,081,654.28
16	698,127.46	6,081,727.94
17	698,118.75	6,081,769.86

PO Box 236
NOWRA
NEW SOUTH WALES 2541

0 125 250
metres

Projection:
MGA Zone 55 (GDA 94)
Base Map:
Nearmap 2021
Image Date:07/02/2021
Final - Version 1

Figure 5: Proposed AHIP Boundary.

N

11.0 RECOMMENDATIONS

The following recommendations are made on the basis of:

- The statutory requirements of the NP&W Act 1974;
- The requirements of Heritage NSW and QPRC;
- The results of the cultural and archaeological assessment, including test excavation;
- An assessment of the likely impacts of the proposed development; and
- The interests of the registered Aboriginal stakeholders and the cultural heritage record.

It was found that:

- No archaeological material was identified within the testing of the area designated PAD1-South (AHIMS #57-2-0975).
- PAD1-South is considered to be highly disturbed throughout on the surface, and no surface or subsurface archaeological material was identified within the top 80cm of deposit during the test excavation program.
- There remains some potential for archaeological deposits to be present at depth and further investigation of these deep deposits is required under an AHIP.
- The PAD1-South boundary has been refined through preparation of an Aboriginal Site Impact Recording Form (ASIRF).
- Site SJ01 was relocated and reassessed, and is considered to be machine impacted material in a highly disturbed context. This site has not been listed on the AHIMS register by the archaeologist who identified the site. As the area is not considered to contain archaeological material, the site should not be registered on AHIMS.

Therefore, the following recommendations have been made.

RECOMMENDATION 1: AHIP APPLICATION NECESSARY

There is some potential for archaeological deposits to be present within the deep alluvial deposits bordering the creekline. Further investigation of the areas proposed to be impacted within these areas is required. It is proposed to utilise machine auguring to investigate these areas due to the depth of deposit present, which is up to 5m. As such, an application for an AHIP will be necessary, as auguring is not permitted under the Code of Practice.

Any further archaeological investigation would likely require a further AHIP application, either to permit harm to archaeological deposits identified, or to permit further salvage excavation in the event extensive archaeological deposits are present.

Recommendation 2: Stop Work Provision

In the unlikely event that suspected human remains are identified during construction works, all activity in the vicinity of the find must cease immediately and the find protected from harm or damage. The NSW Police and the Coroner's Office must be notified immediately. If the finds are confirmed to be human and of Aboriginal origin, further assessment by an archaeologist experienced in the assessment of human remains and consultation with both Heritage NSW and the RAPs for the project would be required.

This recommendation should be included in any Construction Environmental Management Plan developed for the site.

Recommendation 3: Site Boundaries

If there is any change to the boundaries of the proposed development to include areas not assessed as part of this archaeological investigation, further investigation of those areas should be completed to assist in appropriately managing Aboriginal objects and places which may be present.

Recommendation 4: Reporting

One digital copy of this report should be forwarded to Heritage NSW to assist in the assessment of the AHIP application for the project.

One digital copy of this report should be forwarded to the AHIMS registrar for inclusion on the AHIMS database.

One copy of this report should be forwarded to each of the registered Aboriginal stakeholders for the project.

12.0 BIBLIOGRAPHY

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Appendix A: Additional Community Consultation

2046 Queanbeyan-Palerang Regional Sports Complex Test Excavation – Consultation Log

Date	Type of Consultation	Parties Contacted	Outcome
02/09/2020	Notification of test excavation	HNSW	15/9/2020 – Sarah Robertson of HNSW requested updated mapping of test excavation areas, which was provided. 12/11/2020 – further email confirming the completion of test excavation.
29/09/2020	RAP enquiry	Dean Bell – Yurwang Gundana CHS	Dean requested an update on the project status and updated his current email address which had changed since initial consultation was undertaken. JB advised Dean that the draft test excavation report would be sent through once complete.
25/11/2020	Provision of draft Aboriginal Test Excavation Report for review and comment Comments received until 11/1/2021	Ngambri LALC	No response
		Corroboree Aboriginal Corporation	No response
		Murra Bidgee Mullangari Aboriginal Corporation	1/12/2020 – email stating "I have read the project information and draft test excavation for the above project, I endorse the recommendations made".
		Goobah Development Pty Ltd	No response
		Didge Ngunawal Clan	No response
		Ginninderra Aboriginal Corporation	No response
		Muragadi Heritage Indigenous Corporation	30/11/2020 – email stating "I have read the project information and methodology for the above project, I agree with the recommendations made".
		Merrigarn Indigenous Corporation	No response
		Gulgunya Ngunawal Heritage Aboriginal Consultancy	No response
		Thunderstone Aboriginal Cultural and Land Management Services Aboriginal Corporation	No response
		Karlari Ngunnawal Pajong Wallabaloa Descendants	No response
		Clive Freeman	25/11/2020 – email received stating "…as I couldn't take part in this excavation for this project (covid) and also it being my policy not to make comment on any project which I've not had a hands-on involvement with, I have no issues with the report or it's commentary, which were comprehensive and clear."

		Lavinus Ingram	No response
		Yurwang Gundana Cultural Heritage Services	No response
		PD Ngunawal Consultancy	No response
		Gunjeewong Cultural Heritage Aboriginal Corporation	No response
		Kinanggo Aboriginal Cultural Heritage Services	No response

From: yurwang gundana
To: Jenni Bate
Subject: Re: South Jerrabomberra Sporting Complex Project
Date: Tuesday, 29 September 2020 6:07:27 PM

Sorry Jenni for all of the confusion but originally I used my personal email address of ngunawal56@outlook.com to contact Navin Officer as my business email address of Yurwang Gundana Cultural Heritage Services was not available at that time.

My full name, Robert Dean Bell comes up on my personal email address.

Yurwang Gundana CHS would like to be included in on any further disturbance(s) of the grounds of the Sporting Complex Project as I am a Ngunawal Traditional Owner with Cultural knowledge of the area.

Thanking You

Dean Bell
Yurwang Gundana Cultural Heritage Services.

From: Jenni Bate <jenni@apexarchaeology.com.au>
Sent: 29 September 2020 15:26
To: yurwang gundana <Yurwang.Gundana.C.H.S@outlook.com>
Subject: RE: South Jerrabomberra Sporting Complex Project

Hi Dean,

Thank you for your email. We have been engaged by QPRC to undertake the required test excavation for the project. Navin Officer have provided a list of the RAPs for the project to us. I don't see your name on the list, although I do see Yurwang Gundana Cultural Heritage Services with a different contact person and email address – is this your group?

Consultation to date has been undertaken by Navin Officer in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (ACHCRs). A test excavation report will be sent to all RAPs once it is prepared, in accordance with the ACHRCs.

Kind regards,

APEX ARCHAEOLOGY

Jenni Bate
DIRECTOR - ARCHAEOLOGIST

0422 229 179
JENNI@APEXARCHAEOLOGY.COM.AU
WWW.APEXARCHAEOLOGY.COM.AU

From: yurwang gundana <Yurwang.Gundana.C.H.S@outlook.com>
Sent: Tuesday, 29 September 2020 12:11 PM
To: jenni@apexarchaeology.com.au
Subject: South Jerrabomberra Sporting Complex Project

My name is Dean Bell and I am one of the Registered Aboriginal Parties (RAP's) with Environment NSW, I would appreciate some information on where the Jerrabomberra Sporting Complex Project is currently at.
As a Traditional Owner of the lands this project is on, I have not been informed about the progress of this project.

Dean Bell
Yurwang Gundana
29/09/2020

From:	Jenni Bate
To:	"undisclosed recipients"
Bcc:	"ngambrilalc@gmail.com"; "Marilyn Carroll-Johnson"; "Darleen Johnson"; "bunjilsmith@gmail.com"; "didgengunawalclan@yahoo.com.au"; "ginninderra.corp@gmail.com"; "muragadi@yahoo.com.au"; "Shaun Carroll"; "gulgunyaNHAC@hotmail.com"; "Tyronne & Bronwyn"; "ringram6033@gmail.com"; "Clive Freeman"; "ngunawal56@outlook.com"; "pd.ngunawalconsultancy@gmail.com"; "Cherie Carroll Turrise"; "konanggo_consultancy@hotmail.com"
Subject:	Queanbeyan-Palerang Regional Sports Complex - draft test excavation report
Date:	Wednesday, 25 November 2020 11:45:00 AM
Attachments:	2046 QPRC Regional Sports Complex Site - Draft Test Excavation report.pdf

Good afternoon,

I hope you're well. Please find attached the draft test excavation report for the above project for your review and comment.

Please provide comments by Monday 11 January 2020 (an extended period to account for the holiday break).

Please don't hesitate to contact me if you have any queries.

Kind regards,

APEX ARCHAEOLOGY

Jenni Bate
DIRECTOR - ARCHAEOLOGIST

0422 229 179
JENNI@APEXARCHAEOLOGY.COM.AU
WWW.APEXARCHAEOLOGY.COM.AU

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Apex Archaeology wishes everyone a safe and restful holiday season. We will be closed from CoB 18 December 2020 and will reopen 11 January 2021.

From: Glen Freeman
To: Jenni Bate
Subject: Re: Queanbeyan-Palerang Regional Sports Complex - draft test excavation report
Date: Wednesday, 25 November 2020 12:37:39 PM

Yadhungdhunga (hello, good day) Jenni,

I am well, thank you , as I hope you are as well, as I couldn't take part in this excavation for this project (covid)

and also it being my policy not to make comment on any project which I've not had a hands-on involvement

with, I have no issues with the report or it's commentary, which were comprehensive and clear.

Kind regards,

Glen Freeman
Ngunawal Elder, Principal/Sole Trader
Gulgunya Ngunawal Heritage Aboriginal Consultancy(GNHAC)

Sent from Outlook

From: Jenni Bate <jenni@apexarchaeology.com.au>
Sent: Wednesday, 25 November 2020 11:45 AM
To: undisclosed recipients <jenni@apexarchaeology.com.au>
Subject: Queanbeyan-Palerang Regional Sports Complex - draft test excavation report

Good afternoon,

I hope you're well. Please find attached the draft test excavation report for the above project for your review and comment.

Please provide comments by Monday 11 January 2020 (an extended period to account for the holiday break).

Please don't hesitate to contact me if you have any queries.

Kind regards,

APEX ARCHAEOLOGY

Jenni Bate
DIRECTOR - ARCHAEOLOGIST

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From: jesse johnson
To: Jenni Bate
Subject: Re: Queanbeyan-Palerang Regional Sports Complex - draft test excavation report
Date: Monday, 30 November 2020 4:02:43 PM

Hi Jenni
I have read the project information and methodology for the above project, I agree with the recommendations made.
Kind regards
Jesse Johnson
0418970389

On Wednesday, 25 November 2020, 11:46:10 am AEDT, Jenni Bate <jenni@apexarchaeology.com.au> wrote:

Good afternoon,

I hope you're well. Please find attached the draft test excavation report for the above project for your review and comment.

Please provide comments by Monday 11 January 2020 (an extended period to account for the holiday break).

Please don't hesitate to contact me if you have any queries.

Kind regards,

APEX ARCHAEOLOGY
Jenni Bate
DIRECTOR - ARCHAEOLOGIST
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From:	Darleen Johnson
To:	Jenni Bate
Subject:	Re: Queanbeyan-Palerang Regional Sports Complex - draft test excavation report
Date:	Tuesday, 1 December 2020 4:25:25 PM

Hi Jenni
I have read the project information and draft test excavation for the above project, I endorse the recommendations made.
Kind regards
Ryan Johnson
0475565517

On Wednesday, 25 November 2020, 11:46:07 am AEDT, Jenni Bate <jenni@apexarchaeology.com.au> wrote:

Good afternoon,

I hope you're well. Please find attached the draft test excavation report for the above project for your review and comment.

Please provide comments by Monday 11 January 2020 (an extended period to account for the holiday break).

Please don't hesitate to contact me if you have any queries.

Kind regards,

APEX ARCHAEOLOGY
Jenni Bate
DIRECTOR - ARCHAEOLOGIST
0422 229 179
JENNI@APEXARCHAEOLOGY.COM.AU
WWW.APEXARCHAEOLOGY.COM.AU

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Appendix B: Additional Investigation Methodology

QUEANBEYAN-PALERANG REGIONAL SPORT COMPLEX SITE, SOUTH JERRABOMBERRA, NSW

MACHINE AUGURING TEST EXCAVATION METHODOLOGY

LGA: Queanbeyan-Palerang Reginal Council

April 2021

PO Box 236, Nowra, NSW 2541 | heritage@apexarchaeology.com.au | www.apexarchaeology.com.au

ABN 56 625 618 993

Apex Archaeology would like to acknowledge the Aboriginal people who are the traditional custodians of the land in which this project is located. Apex Archaeology would also like to pay respect to Elders both past and present.

Document Control

The following register documents the development and issue of the document entitled 'Queanbeyan-Palerang Regional Sport Complex Site, South Jerrabomberra, NSW – Machine Auguring Test Excavation Methodology', prepared by Apex Archaeology in accordance with its quality management system.

Revision	Prepared by	Reviewed by	Comment	Issue Date
1 – Draft	Leigh Bate	Jenni Bate	HNSW review	24 April 2021

GLOSSARY OF TERMS

Aboriginal Object	An object relating to the Aboriginal habitation of NSW (as defined in the NPW Act), which may comprise a deposit, object or material evidence, including Aboriginal human remains.
ACHA	Aboriginal Cultural Heritage Assessment
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRs	The DECCW April 2010 *Aboriginal cultural heritage consultation requirements for proponents 2010*
AHIMS	Aboriginal Heritage Information Management System maintained by Heritage NSW, detailing known and registered Aboriginal archaeological sites within NSW
AHIP	Aboriginal Heritage Impact Permit
ATER	Aboriginal Test Excavation Report
BP	Before Present, defined as before 1 January 1950.
Code of Practice	The DECCW September 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*
Consultation	Aboriginal community consultation in accordance with the DECCW April 2010 *Aboriginal cultural heritage consultation requirements for proponents 2010.* Consultation is not a required step in a due diligence assessment; however, it is strongly encouraged to consult with the relevant Local Aboriginal Land Council and to determine if there are any Aboriginal owners, registered native title claimants or holders, or any registered Indigenous Land Use Agreements in place for the subject land
DA	Development Application
DECCW	The Department of Environment, Climate Change and Water – now Heritage NSW
Disturbed Land	If land has been subject to previous human activity which has changed the land's surface and are clear and observable, then that land is considered to be disturbed
DPIE	Department of Planning, Industry and Environment
Due Diligence	Taking reasonable and practical steps to determine the potential for an activity to harm Aboriginal objects under the *National Parks and Wildlife Act 1974* and whether an application for an AHIP is required prior to commencement of any site works, and determining the steps to be taken to avoid harm
Due Diligence Code of Practice	The DECCW Sept 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*
GIS	Geographical Information Systems
GSV	Ground Surface Visibility
Heritage NSW	Heritage NSW in the Department of Premier and Cabinet, incorporating the former DPIE/OEH and Heritage Branch
Harm	To destroy, deface or damage an Aboriginal object; to move an object from land on which it is situated, or to cause or permit an object to be harmed
LALC	Local Aboriginal Land Council
NPW Act	NSW *National Parks and Wildlife Act* 1974
NPWS	National Parks and Wildlife Service
OEH	Office of Environment and Heritage – now Heritage NSW
QPRC	Queanbeyan-Palerang Regional Council
RAPs	Registered Aboriginal Parties

CONTENTS

FIGURES

1.0 INTRODUCTION

Apex Archaeology were engaged to undertake an archaeological test excavation in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (April 2011); the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, April 2010) (the ACHCRs); and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (September 2010) (the Code of Practice), in advance of a proposed development for the Queanbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW.

A process of Aboriginal community consultation in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (the ACHCRs) has been undertaken by Apex Archaeology.

The site contains potential for buried land surfaces to be present, as identified by Dr Sam Player (2021). These buried land surfaces may contain evidence of past Aboriginal occupation. These potential buried land surfaces are at a depth greater than that targeted during the test excavations, which reached a depth of approximately 80cm. Deeper excavations would not be possible under the Code of Practice, due to the strict requirements for test pit size, and as such, further investigation of whether any evidence of Aboriginal occupation exists within this area requires consent under an Aboriginal Heritage Impact Permit (AHIP). Even combining test excavation pits to the maximum allowed under the Code of Practice would not permit the required depth to be safely reached.

The following document provides information about the project, and outlines the detailed methodology for additional machine auger test excavation of deep deposits (>3m) Apex Archaeology proposes to utilise for this project.

In the event significant archaeological evidence is recovered during the testing phase, it is likely that a second AHIP would be needed to permit impact. Salvage excavation may also be necessary dependant on what is recovered and would be a condition of the second AHIP. This will be determined on completion of the initial investigation works under the approved AHIP.

1.1 STUDY AREA AND PROJECT BRIEF

The study area comprises Lot 1 DP 313299 and Lot 6 DP 239080. It is proposed to construct a regional sporting hub which would provide a sporting centre of excellence servicing Queanbeyan and the wider southern tablelands, along with associated carparking, infrastructure and landscaping within the area.

Test excavations were completed over two weeks in September/October 2020. Test excavations were undertaken within an area of Potential Archaeological Deposit (PAD) located along Jerrabomberra Creek within the study area. Areas for test excavation were selected based on the PAD identified by NOHC and areas that would

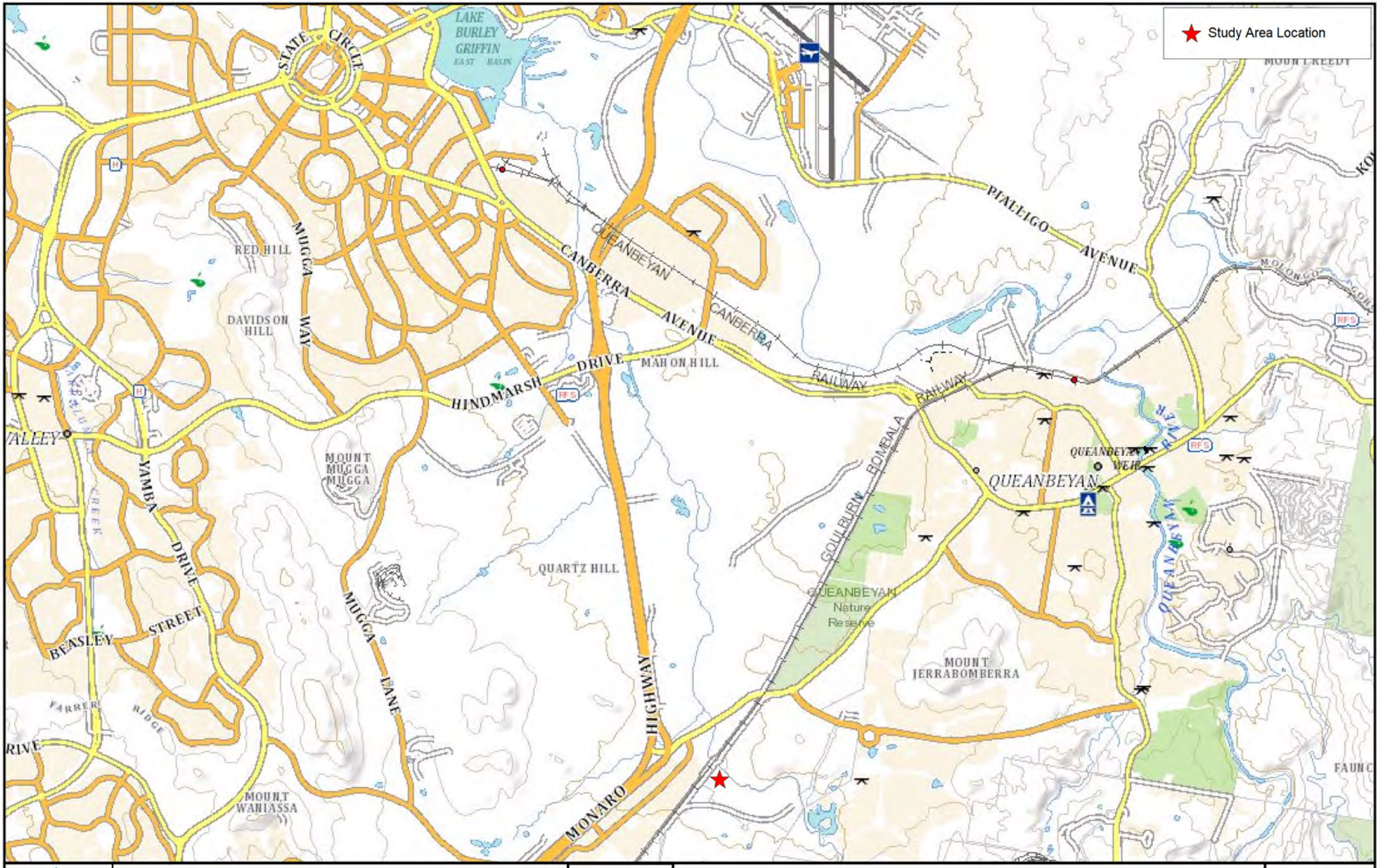
be impacted as a part of the QPRC proposal. The level of disturbance from the previous land use as a raceway and associated access tracks and carparking has dramatically reduced the amount of area considered to be minimally impacted within this area.

A total of 63 test pits were excavated within the study area. No archaeological material was recovered from any of these test pits, which were excavated to a maximum depth of 80cm.

A subsequent geomorphological assessment of the area by Dr Sam Player identified potential for buried land surfaces to be present within the alluvial deposits bordering the creekline. A soil sample was taken at 80cm depth for radiocarbon dating, as this was considered an appropriate analysis to determine the approximate age of this potential land surface, to inform whether it may have been a viable occupation level for Aboriginal habitation. In the event that the results of the dating suggested this land surface was older than 10-15,000 years, this would suggest that any deeper deposits would be older again, and thus would preclude Indigenous occupation of the area.

The results from this analysis determined that the layer was approximately 2,400 years old and that possible occupation below this within the buried residual land surface from 3 to 6m could not be ruled out. As such, a process of machine auger test excavation is proposed to be utilised to determine if there are any artefacts buried at depth which may be impacted by the proposed Regenerative Stormwater Conveyance (RSC) waterway.

Additionally, Dr Player's assessment identified the formation of the site as comprising both fluvial and alluvial processes. Areas formed by fluvial actions were unlikely to have been utilised as occupational sites, but alluvial areas had potential to be stable, dry surfaces suitable for habitation.



PO Box 236
NOWRA
NEW SOUTH WALES 2541

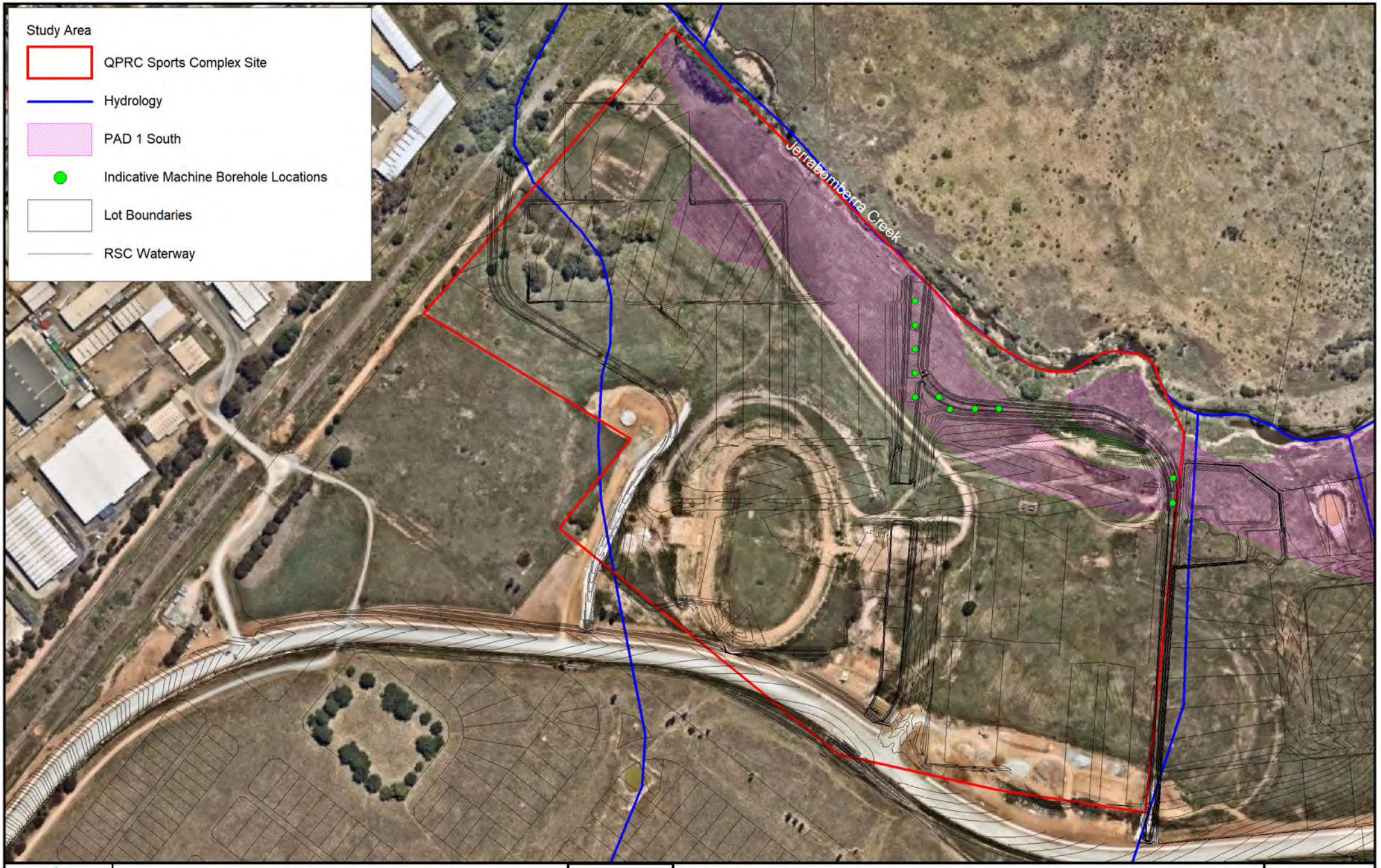
0 1.9 3.8

kilometres

Projection:
MGA Zone 55 (GDA 94)
Base Map:
SixMaps Topo
Final - Version 1

Figure 1: General location of the proposed development in its regional context

N



PO Box 236
NOWRA
NEW SOUTH WALES 2541

0 125 250
metres

Projection:
MGA Zone 55 (GDA 94)
Base Map:
Nearmap 2021
Image Date:07/02/2021
Final - Version 1

Figure 2: Indicative Machine Auger Test Pit locations within PAD1-South.

N

2.0 Archaeological Excavation Methodology

This methodology would be implemented on receipt of an AHIP within the area proposed for Regenerative Stormwater Conveyance (RSC) areas excavated as a part of the overall sports complex site development.

2.1 Auger Holes

- Test auger holes will be ~15" (38cm) and excavated using an excavator with a bucket auger;
- Auger holes will be excavated along transects spaced at 20m;
- Depths of each pass of the auger (ie spits) will be consistently checked with a hand tape measure to ensure accuracy of excavation depth as much as possible given the nature of the auguring process;
- Test pit excavation will cease on reaching basal clay, bedrock or a culturally sterile layer (6m), or at the discretion of the archaeologist (ie if pits cannot be safely excavated further);
- The soil from each spit (20-30cm) will be placed on tarps and bucketed up in 10L plastic buckets and transported to the sieving station;
- To ensure sufficient control of each spit excavated, a bag with a label will be written on to accompany the buckets from each spit. The following information will be recorded on each bag and tag: site name, date, pit location (easting & northing) and name of excavator;
- All material from each auger hole will be wet sieved through table sieves (1 x 1m) with a wire mesh aperture gauge of 3mm or 5mm depending on the soil matrix;
- All material recovered from the sieving process will be checked by a qualified archaeologist with experience in artefact identification prior to being placed into the spit bag; and
- Artefact counts will be recorded for each spit.

2.2 Recording

- Each auger hole will be recorded with the following information:
    - site name;
    - date;
    - excavator name;
    - number of spits;
    - depth of each spit (~20-30cm);
    - pit location (easting & northing);
    - start levels & end levels;
    - bucket count and end total bucket count;
    - soil description;
    - description of disturbance;
    - description of artefacts (material type & artefact type);
    - photograph details (Auger hole and context shots).

It is noted that individual spits may vary in depth due to the nature of the excavation method. This will be controlled as far as possible in the field to assist in identifying depths of artefacts, should any be recovered.

2.3 Further Salvage

If the machine auger test excavation identifies further intact archaeological features (e.g., artefact deposits), further salvage of these features would occur under a subsequent AHIP. An application for this secondary AHIP would be made directly following the test excavation phase, in the event it is necessary. A salvage strategy will be developed once the nature of any deposits are understood within the study area.

2.4 Artefacts and Chain of Custody

Any artefacts recovered from the excavation will be analysed by Dr Beth White, who is an archaeologist with over 30 years' experience in artefact analysis and interpretation. During the analysis the artefacts will be temporarily stored at her office. Artefacts will be temporarily held at Apex Archaeology's office in a lockable cupboard before being sent for analysis to Dr White, and once returned, until a determination of the final repository is made and they can be securely managed in their final location.

Once the artefacts are reburied, repatriated to the community or provided to the Australian Museum or local museum (as applicable), the location will be recorded and provided to AHIMS. Until the assemblage is excavated and analysed it is not possible to confirm if the Australian Museum will accept the assemblage for deposition, as they have detailed criteria used in the determination of which assemblages they will accept and cannot be satisfied until the assemblage is analysed. The final deposition of the artefacts will be determined in consultation with the RAPs for the project, the proponent, and Heritage NSW. It is likely that any excavated material would be reburied on site in a location that would not be disturbed in future.

2.5 Cessation of Excavation

Excavations will cease upon reaching basal clay, bedrock or a culturally sterile layer, or at the discretion of the archaeologist (for example, if excavations cannot continue in a safe manner due to depth, nature of soil, etc).

2.6 Backfill and Salvage Excavation

At the conclusion of the archaeological program, the area will be managed appropriately dependant on the results of the excavation.

In the event that no artefacts are recovered, the proposed construction of stormwater services will proceed with no further archaeological work necessary.

In the event significant deposits requiring further investigation are recovered, the area would be secured to ensure safety. Ply boards would be secured above each auger hole and the entire area bunded off. Consideration was given to placement of geofab or similar within the auger holes was made in preparing this methodology, but this is unlikely to be possible due to the small diameter of the auger holes proposed to be excavated. Covering the holes is considered an appropriate measure to secure the open holes.

3.0 REFERENCES

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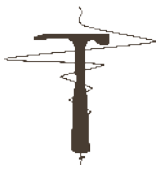
Player, S. 2021, *The Depth of the Archaeological Context at the Queanbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW.* Report to Apex Archaeology.

Appendix C: Geomorphological Assessment

The Depth of the Archaeological Context at the Quenbeyan-Palerang Regional Sports Complex Site, South Jerrabomberra, NSW.

Report to Apex Archaeology

23rd April 2021



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1 Introduction

The Queanbeyan-Palerang Regional Council (QPRC) propose to build a sporting facility in South Jerrabomberra, NSW. As part of the assessment of Aboriginal heritage values that may be impacted by the project, Navin Officer Heritage Consultants (NOHC) conducted community consultation and advised that archaeological excavations should be conducted to examine the deeper substrate for evidence of Aboriginal heritage. Apex Archaeology (Apex) undertook those excavations under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)*. The code of practice allows for physical examination of an area without need for a permit but only allows for 50x50cm square test pits, making examination of deeper sediments problematic. The Heritage Council replied to Apex suggesting that deeper examination may be appropriate. Geoprospection was engaged to provide a geological perspective for the necessity of deeper examination.

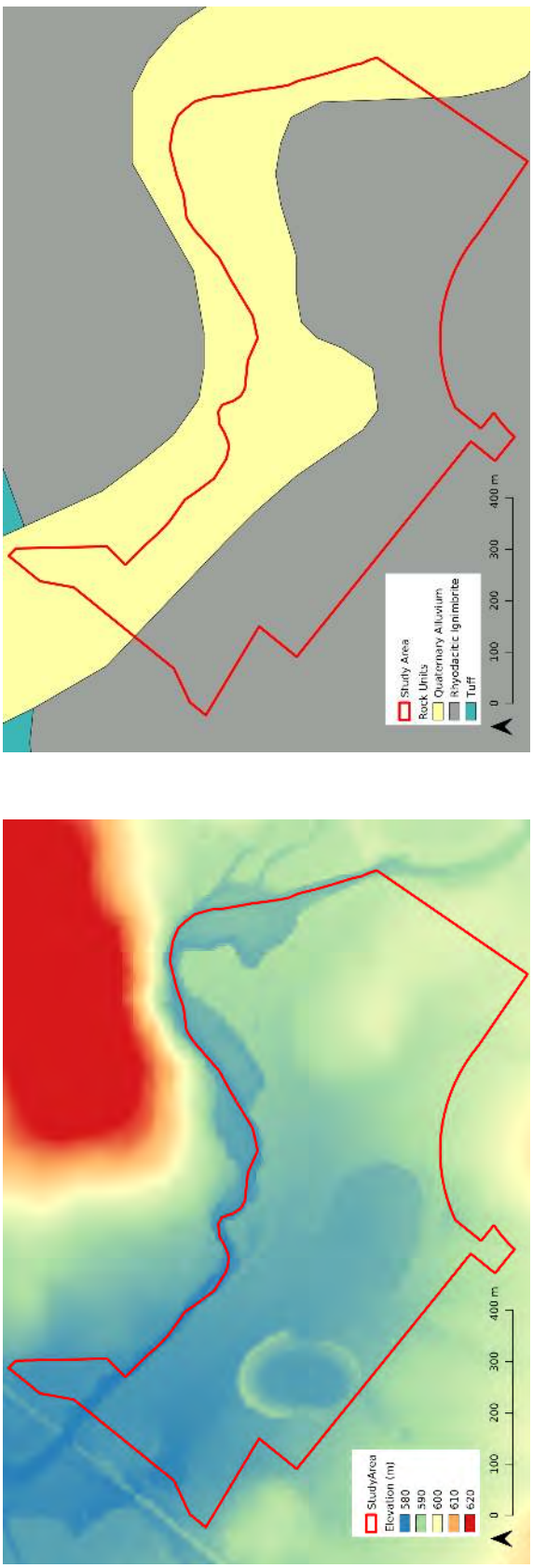
2 The Physical Setting

The study area is located on the Werriwa Tablelands of the Kosciuszkan Uplands Province, characterised by mountains and plateaus (Pain et al., 2011). It sits largely on a level-flat landform with gentle lower slopes in the east and perhaps the southern edge (Figure 1a). The northern boundary of the study area coincides with the course of Jerrabomberra Creek, broadening and flowing northwest after emerging from lower slopes in the southeast.

The level-flat landform is composed of Quaternary-aged sediments (Qa) (Figure 1b) described broadly as alluvium and fluvial deposits including gravel, sand, silt and clay (Figure 1b). Underlying the Quaternary-aged sediments and outcropping to the east are Silurian-aged volcanics composed predominantly of rhyodacitic ignimbite, but also minor volcaniclastic and argillaceous sediments (Abell, 1992). Upstream, Jerrabomberra Creek also traverses rhyolitic to rhyodacitic crystal and lithic tuff, minor siltstone, sandstone, and limestone, dacite, andesite, rhyolite, tuff; all of which may occur as clasts of the bedload and floodplain of Jerrabomberra Creek.

Soils developed on the level-flat and corresponding well with the Quaternary-aged sediments are represented by the Ginninderra Creek soil landscape (Figure 1c). The lower slopes occurring in the east and southern edge of the study area correspond to the volcanic geology, and are represented by the Williamsdale and Luxor soil landscapes. The Ginninderra Creek soil landscape is largely characterised by deep (>100 cm), poorly drained Stratic Rudosols developed on floodplain landform elements and composed of clay loams to clays with loamy sands occurring nearer to the drainage channels. Within the study area the Williamstown and Luxor soil landscapes are characterised by moderately to very deep texture-contrast podzolic soils (Jenkins, 2000).

The vegetation within the study area is almost completely composed of grassland, and include numerous species of exotic weeds. Some riparian woodland occurs associated with the riparian zone of Jerrabomberra Creek (Figure 1d).



(a) Terrain (Source: Geoscience Australia (2015)). (b) Geology. (Source:). (c) Soil (Source:). (d) Location (Source: SixMaps).

Figure 1: Maps showing the location of the site relative to 1a) local elevation, 1b) geology, 1c) soil landscapes, and 1d vegetation.

3 Methods

The local geology and soil distribution was assessed using available digital resources (Abell, 1992; Jenkins, 2000). The local geomorphology was assessed using 5 m horizontal resolution LiDar data sourced from Geoscience Australia (2015).

A site inspection was undertaken on the 3^{rd} March 2021 and initially included assessment of the floodplain stratigraphy by examining the bank of Jerrabomberra Creek at approximately 698245 E 6081742 N (GDA94 Zone 55). Subsequently, three boreholes, BH1, BH2, and BH3, were sampled using a hand operated auger and corer (Figure 2) and described using the terminology of The National Committee on Soil and Terrain (2009). Each borehole was located within the footprint of storm water installations proposed as part of the development.

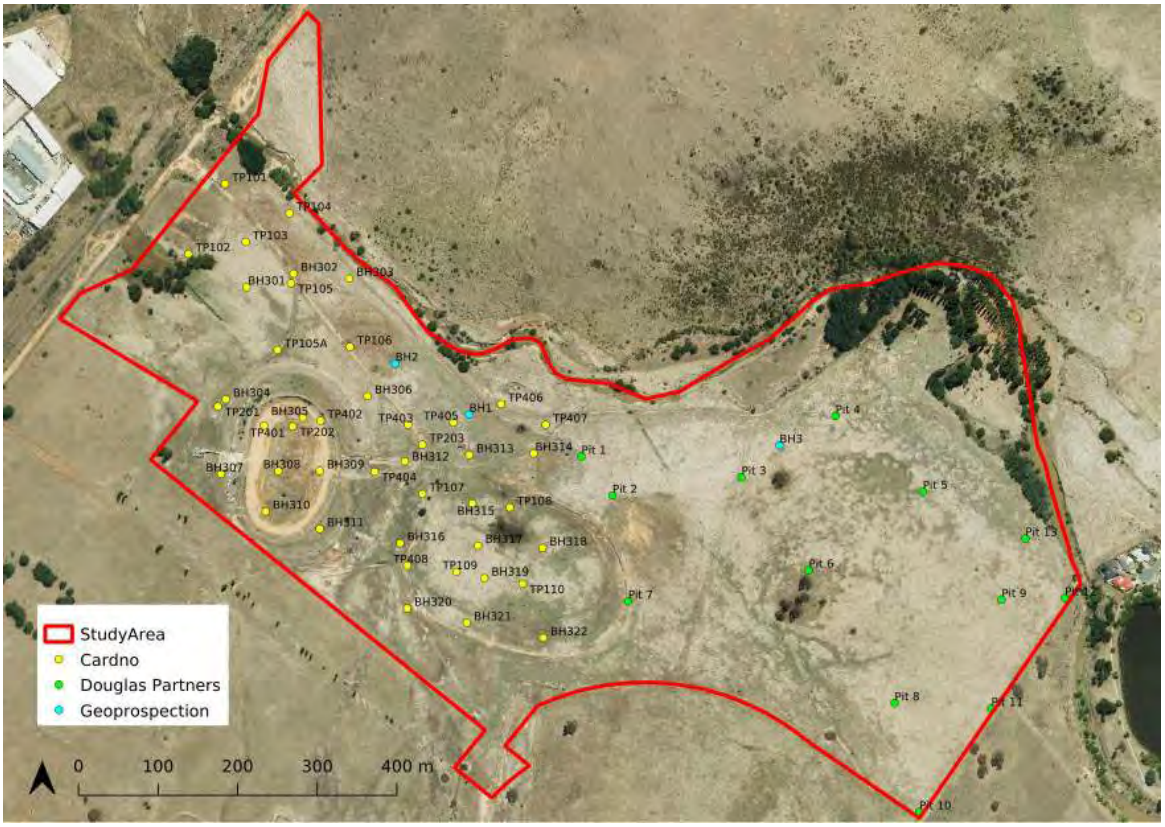


Figure 2: Location of borehole samples relative to the study area boundary.

A single bulk sample of soil was extracted from the bank of Jerrabomberra Creek at 698125 E 6081759 N (GDA94 Zone 55) and at approximately 80 cm depth. The sample was likely from the same unit that had frequently occurred in the base of test excavations (see TP26 Apex Archaeology, 2021, p. 26). The material was dark and suspected to contain enough organic material to be dated by radiocarbon methods. The sample was sent to the University of Waikato Radiocarbon Dating Laboratory for analysis by Accelerator Mass Spectrometry (AMS).

Figure 3: Dark unit at the near surface represents a former backswamp rich in datable organics.

4 Results

4.1 Surface Disturbance

The ground surface of the site appeared largely undisturbed beyond the occurrence of pastured agriculture and vehicle tracks. Most notable was the presence of a mound of earth materials at the south western edge of the site, raised perhaps up to 6 m in height. The origin of those materials were discussed with Apex and it was hypothesised that the materials may have been excavated from the ground surface. A heritage listed building occurred in the central north of the site, and while potentially not very old did not appear to be raised above the ground surface (Figure 4). It was suggested that as long as the building can be observed in aerial imagery prior to the emergence of the earth mound then the ground has likely not been truncated.

Analysis of the 5 m resolution LiDar data, sourced from Geoscience Australia (2015), showed that the earthen mound is in fact an ellipsoid-shaped bank (Figure 1a). Furthermore, an east-west oriented U-shaped truncation can clearly be seen in the central south of the study area and is likely to be the source of the earthen mound materials. The study area can therefore be regarded to be largely in-tact excepting for an extensive truncation in the central south.

Figure 4: A heritage listed building showing the existing ground surface has not been truncated since construction.

4.2 Floodplain Stratigraphy

The bank of Jerrabomberra Creek exposed the complete sequence of the floodplain. The basement of the floodplain was bounded by dacitic bedrock overlain by a distinct unit of cobbles, and then by a complex sequence of finer fluvial and alluvial units (Figure 5). The architechture of the floodplain stratigraphy was complimented by three boreholes located within the footprint of stormwater drains (Figure 2).

4.2.1 BH1

Borehole BH1 was sampled at 698189 E 6081647 N (GDA94 Zone 55). The base of the sequence was composed of fine fluvial gravel overlain by alluvial units of light sandy clay, and silty clay. The upper two units were likely fluvial in origin given the presence of gravels, although soil processes have since been active. Depths at which archaeological materials may have accumulated include the units between 195–110 cm, which were alluvial and would only have been intermittently flooded, and the biomantle of the uppermost unit.

Figure 5: Stratigraphy of the right bank of Jerrabomberra Creek. Dacite bedrock is overlain by cobbles and finer-grained fluvial and alluvial sediments.

4.2.2 BH2

Borehole BH2 was sampled at 698096 E 6081711 N (GDA94 Zone 55). The base of the sequence was composed of alluvail units of light clay, overlain by two alluvial units of light silty clay. The upper two units were likely fluvial in origin being composed of sands with fine gravels. Depths at which archaeological materials may have accumulated include the units between 270–80 cm, which were alluvial and would only have been intermittently flooded, and the biomantle of the uppermost unit.

4.2.3 BH3

Borehole BH3 was sampled at 698584 E 6081601 N (GDA94 Zone 55). The base of the sequence was composed of two residual weathering units of clay, overlain by two units of units of silty clay loam, the uppermost being a biomantle. Those units were pedological in origin and there were no extant depositional materials. Depths at which archaeological materials may have accumulated include only the biomantle.

Table 1: Field description of BH1.

Depth (cm)	*Description*
0 to 43	Brown, 10YR 4/2 (dry); fine gravelly silty clay loam; dry to:-
43 to 110	Yellow, 10YR 6/4 (dry); fine gravelly clayey sand to:-
110 to 150	Pale yellow, 10YR 8/1 (dry); silty clay; few, fine, orange mottle to:-
150 to 195	Yellow, 10YR 4/4 (moist); light sandy clay; common, coarse, white nudules to:-
195 to 250	Yellow; fine to medium gravel

Table 2: Field description of BH2.

Depth (cm)	*Description*
0 to 40	Brown, 10YR 4/2 (moist); loamy sand, fine gravelly; slightly moist to:-
40 to 80	White, 10YR 5/2 (dry); coarse sand, fine gravelly; dry to:-
80 to 185	Pale grey, 2.5Y 6/2 (moist); light silty clay, fine sandy; dry; common, coarse, orange mottle to:-
185 to 200	Brown, 10YR 4/2 (moist); light silty clay; dry to:-
200 to 270	Grey, 2.5Y 6/3 (moist); light clay, medium sandy

Table 3: Field description of BH3.

Depth (cm)	*Description*
0 to 20	Pale brown, 7.5YR 5/3 (dry); silty clay loam to:-
20 to 40	Pale yellow, 10YR 6/3 (dry); silty clay loam; many, medium, black and orange nodules to:-
40 to 120	Brown, 10YR 5/6 (moist); clay to:-
120 to 150	Grey, 2.5Y 6/2 (moist); clay; common, medium, orange mottle

4.3 Sediment Dating

AMS C_{14} radiocarbon dating of the bulk sample retrieved from the bank of Jerrabomberra Creek was returned as 2420 $\pm$ 80 cal BP at 94.3% probability (Wk-52566). That date can reasonably be correlated with the dark unit exposed at the base of previous test excavations (see TP6 Apex Archaeology, 2021, p. 26). The date was substantially less than the earliest known presence of

Aboriginal people in the region.

5 Discussion

From a strictly geoscientific perspective the study area evidently contained viable archaeological contexts. The surface geomorphology was intact excepting for some minor infrastructure and vehicle tracks. Most substantially is a large mechanically truncated east-west oriented U-shaped area that was the likely source of an elliptical-shaped earthen embankment, located in the southwest of the study area. Nevertheless, the truncation does not likely exceed the depth of the floodplain sediments.

The composition of the floodplain materials did not correspond well to the typical Ginninderra Creek soil landscape, described largely as finer textures such as clay loams and clays. Instead, the materials included frequent coarse gravels, and notably cobbles at the base of its sequence. The frequency of coarse materials might be explained by the geomorphic location of the study area. Not far upstream, Jerrabomberra Creek is incised into the weathered bedrock substrate, suggesting that there is a downstream change in bedrock gradient. The change in gradient would cause flow velocity to decrease and entrained coarser materials to be deposited on the channel bed. Indeed, the presence of a floodplain composed of Quaternary-aged sediments belies that process.

Potentially, much of the base of the floodplain may be composed of cobbles and gravels. Because those gravels were deposited under fluvial conditions, they would not occur as viable archaeological contexts; only objects in secondary context could occur in them. In the current study, fine gravels were noted at the base of BH1 at 1.95 to 2.5 m depth, however, the opposite occurred in the nearby BH2, which was composed of clays at the equivalent depth. Short-range variation of stratigraphy is therefore high and suggests that Jerrabomberra Creek has migrated laterally rapidly in the past. Such a history is consistent with the shallowness of the dacitic bedrock because during high discharge events the stream cross-section would not be able to deepen, but would instead only be able to widen, facilitating lateral migration.

The basal units of a number of previously excavated archaeological test pits were composed of a notably dark unit (see TP6 Apex Archaeology, 2021, p. 26). The origin of the material can likely be attributed to organic detritus of a backswamp. A sample of an equivalent unit from the bank of Jerrabomberra Creek returned an age of approximately 2500 years. Apex Archaeology (2021, p. 16) point out that the earliest signatures of Aboriginal occupation are up to 25,000 years BP, although they come from alpine rock shelters rather than the open sites that would occur within the current study area. Nevertheless, it is reasonable to presume people may have inhabited the local area up to 25,000 years ago and evidence for that would certainly occur deeper than archaeological excavations to date. Potentially then, the age of the approximately 5 m depth of the floodplain sediments may indeed be younger than the maximum known date of Aboriginal occupation of the region.

Despite the likely and relatively young age of the deeper sediments, it is feasible to discount much of the subsurface materials as viable archaeological context based on whether they were formed under fluvial or alluvial conditions. Under fluvial conditions, sediments would be deposited directly within

the stream channel, which can fairly be regarded as uninhabitable. Alternatively, while the sediments would be deposited during flood events, under alluvial conditions the location would be more often dry and inhabitable. It is therefore reasonable to exclude fluvial straigraphic units from any further examination.

6 Conclusion

The floodplain materials deeper than the base of recent test excavations (Apex Archaeology, 2021) are viable as Aboriginal archaeological context. The depth at which the materials become unviable is unknown, although units with a fluvial origin can be discounted.

References

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APPENDIX D: RADIOCARBON DATING REPORT

THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Private Bag 3105
Hamilton,
New Zealand.
Ph +64 7 838 4278
email c14@waikato.ac.nz

Monday, 12 April 2021

Radiocarbon Dating Laboratory

Report on Radiocarbon Age Determination for Wk- 52566

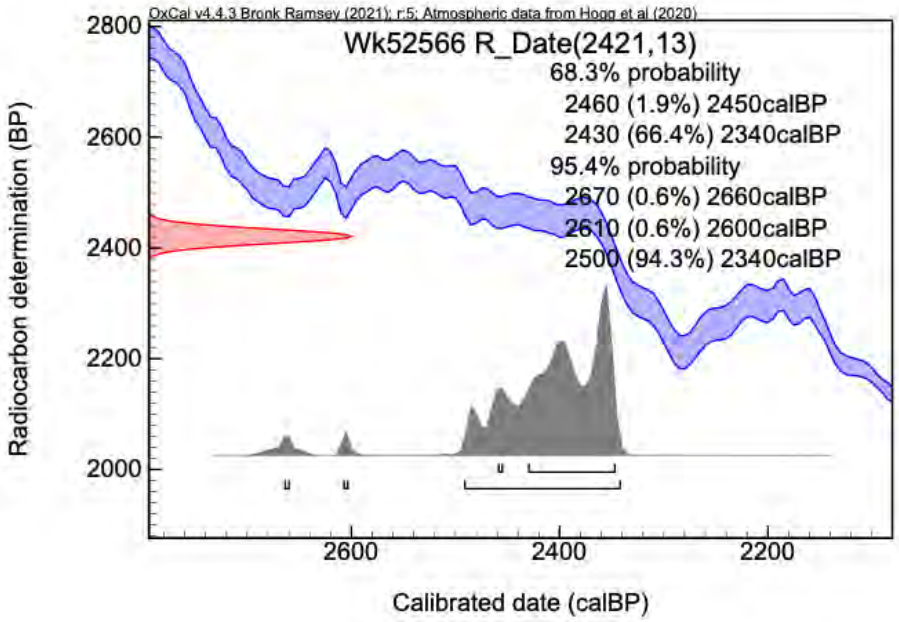
Submitter	L Bate
Submitter's Code	2046 QPRC
Site & Location	South Jarrabomberra, Australia
Sample Material	Soil, organics
Physical Pretreatment	Visible contaminants removed.
Chemical Pretreatment	Sample washed in hot HCl, rinsed and treated with multiple hot NaOH washes. The NaOH insoluble fraction was treated with hot HCl, filtered, rinsed and dried.

$D^{14}C$	-260.2 ±	1.2 ‰
$F^{14}C$%	74.0 ±	0.1 %
Result	**2421 ± 13 BP**	

(AMS measurement)

Comments

Please note: The Carbon-13 stable isotope value ($\delta^{13}C$) was measured on prepared graphite using the AMS spectrometer. The radiocarbon date has therefore been corrected for isotopic fractionation. However the AMS-measured $\delta^{13}C$ value can differ from the $\delta^{13}C$ of the original material and it is therefore not shown.



- Explanation of the calibrated Oxcal plots can be found at the Oxford Radiocarbon Accelerator Unit's calibration web pages (http://c14.arch.ox.ac.uk/embed.php?File=explanation.php)
- Result is *Conventional Age or Percent Modern Carbon (pMC)* following Stuiver and Polach, 1977, Radiocarbon 19, 355-363. This is based on the Libby half-life of 5568 yr with correction for isotopic fractionation applied. This age is normally quoted in publications and must include the appropriate error term and Wk number.
- Quoted errors are 1 standard deviation due to counting statistics multiplied by an experimentally determined Laboratory Error Multiplier.
- The isotopic fractionation, $\delta^{13}C$, is expressed as ‰ wrt PDB and is measured on sample CO_2.
- $F^{14}C$% is also known as *Percent Modern Carbon (pMC).*