APPENDIX M – ABORIGINAL HERITAGE DUE DILIGENCE ASSESSMENT

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Luddenham Quarry Modification Report
DA 315-7-2003 MOD5

Aboriginal Heritage Due Diligence Assessment

Prepared for Coombes Property Group & KLF Holdings Pty Ltd
August 2020

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Luddenham Quarry - Modification 5

Aboriginal heritage due diligence assessment

Report Number

J190749 RP#6

Client

Coombes Property Group

Date

6 August 2020

Version

v1 Final

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6 August 2020

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6 August 2020

Executive Summary

ES1.1 Overview

CFT No. 13 Pty Ltd has recently purchased 275 Adams Road, Luddenham. There is an existing clay/shale quarry on the property, approved under DA 315-7-2003 as modified (the consent). The quarry is currently inactive. Coombes Property Group (CPG) in partnership with KLF Holdings Pty Ltd (KLF) propose to reactivate quarrying operations through a modification of existing consent SSD DA 317-7-2003 (Modification 5 – the proposed modification). CPG/KLF have no relationship to the previous site owners/operators.

EMM Consulting Pty Limited (EMM) has been engaged by CPG and KLF to prepare an Aboriginal due diligence assessment to support the proposed modification. The two main aims of this assessment were to determine if Aboriginal objects will be harmed by the proposed activity and determine if further Aboriginal heritage investigations are required.

ES1.2 Site inspection

On 30 January 2020, the study area was subject to an archaeological site inspection to validate the desktop analysis results. The location of the previously recorded Aboriginal site (#45-5-2280) was ground-truthed and the correct location established. The survey effort confirmed the archaeological potential of the site location has been retained since its original recording. No new Aboriginal sites were identified. Levels of disturbance varied across the study area. Pastoral activities in the northern half of the study area have resulted in moderate disturbance, while the southern half of the study area has experienced heavy disturbance to any culturally bearing soil profile as a result of quarrying. The riparian corridor beside Oaky Creek (outside the proposed disturbance footprint) is deemed to have moderate archaeological potential.

ES1.3 Potential impacts to Aboriginal heritage

The study area has been subject to a high level of disturbance and it is unlikely for Aboriginal objects to occur within the study area apart from the area beside Oaky Creek. The AHIMS site within the study area (#45-5-2280) is outside the area likely to be impacted by the proposed development and is currently protected by fencing.

Specifically, the proposed activities for Modification 5 are unlikely to harm Aboriginal objects. Apart from the internal road which will follow an existing road alignment, all proposed new activities will be at least 200 metres (m) from Oaky Creek and no less than 200 m from Cosgroves Creek (outside the study area to the west of Adams Road).

The proposed location for a new office, and weighbridge in the north-west corner of the study area is situated in an area that has been disturbed by previous clearance and farming activities. Although it is possible for artefacts to occur anywhere in the landscape, they are likely to be rare on this floodplain landform that is more than 200 m from a watercourse.

The proposed extended stockpiling area to the immediate north of the existing stockpile area, and the proposed adjacent equipment laydown area are within areas already disturbed by quarrying and/or farming activities.

ES1.4 Recommendations

In accordance with the steps presented in the NSW guidelines Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (DECCW 2010), a due diligence assessment in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010) has been completed as a first step to identify whether Aboriginal objects or places are likely to be harmed by the project. Based on the current available project design and disturbance footprint, this assessment concludes that Aboriginal objects are unlikely to be harmed by the project and further investigation beyond the scope of a due diligence assessment is not currently warranted for the project.

Further investigation in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) is unlikely to build upon the findings of this assessment, unless test excavation is explored. However, the project impact footprint would not meet the pre-conditions warranting test excavation because a potential archaeological deposit (PAD) has not been identified in the current or previous investigations of the study area. As such, further investigation is not considered to be warranted as Aboriginal objects are unlikely to be harmed by the proposed modification.

The following recommendations are based on the proposed modification in its current design:

1. AHIMS site #45-5-2280 continues to be avoided and protected by fencing.

2. The corrected coordinates for AHIMS site #45-5-2280 are entered in the AHIMS database.

3. The riparian corridor along the western bank of Oaky Creek continues to be avoided by quarrying activities.

4. If works are to proceed, the following should occur:

    a) In the event that unexpected Aboriginal objects, sites or places are discovered in the study area, it is a requirement that DPIE is notified of the existence of Aboriginal objects as soon as practicable after they are first identified. Under s85A of the NPW Act, Aboriginal objects remain the property, and under the protection of, the Crown until formal transfer to a person or persons of a class prescribed by the regulations occurs.

    b) In the event that known or suspected human skeletal remains are encountered within the study area, the immediate vicinity should be secured, appropriate procedures followed, and the Department of Planning Industry and Environment be contacted for advice.

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1 Introduction

1.1 Background

CFT No 13 Pty Ltd, a member of Coombes Property Group (CPG), has recently acquired the property at 275 Adams Road, Luddenham NSW (Lot 3 in DP 623799, 'the site') within the Liverpool City Council municipality. The site is host to an existing shale/clay quarry.

CPG owns, develops, and manages a national portfolio of office, retail, entertainment, land, and other assets. The company's business model is to retain long-term ownership and control of all its assets. CPG has the following staged vision to the long-term development of the site:

- Stage 1 Quarry Reactivation: **Solving a problem**. CPG intends to responsibly avoid the sterilisation of the remaining natural resource by completing the extraction of shale which is important to the local construction industry as raw material used by brick manufacturers in Western Sydney. Following the completion of approved extraction activities, the void will be prepared for rehabilitation.

- Stage 2 Advanced Resource Recovery Centre and Quarry Rehabilitation: **A smart way to fill the void**: CPG in partnership with KLF Holdings Pty Ltd (KLF) and in collaboration between the circular economy industry and the material science research sector, intends to establish a technology-led approach to resource recovery, management, and reuse of Western Sydney's construction waste, and repurposing those materials that cannot be recovered for use to rehabilitate the void. This will provide a sustainable and economically viable method of rehabilitating the void for development.

- Stage 3 High Value Employment Generating Development: **Transform the land to deliver high value agribusiness jobs**. CPG intends to develop the rehabilitated site into a sustainable and high-tech agribusiness hub supporting food production, processing, freight transport, warehousing, and distribution, whilst continuing to invest in the resource recovery R&D initiatives. This will deliver the vision of a technology-led agribusiness precinct as part of the Aerotropolis that balances its valuable assets including proximity to the future Western Sydney Airport (WSA) and Outer Sydney Orbital.

This report relates to a modification application relating to the delivery of stage 1 above.

1.2 Overview

CPG in partnership with KLF are seeking to reactivate quarrying operations of an existing clay/shale quarry through a modification of the existing State significant development (SSD) consent SSD DA 315-7-2003 (the proposed modification). CPG/KLF have no relationship to the previous site owners/operators.

The site has previously been assessed for Aboriginal Heritage as part of the application for DA 315-7-2003. As there is a potential for the proposed modification to disturb areas that are not currently disturbed by quarry activities, EMM Consulting Pty Limited (EMM) has been engaged by CPG and KLF to prepare an Aboriginal due diligence assessment to support the proposed modification. The two main aims of this assessment were to determine if Aboriginal objects will be harmed by the proposed activity and determine if further Aboriginal heritage investigations are required.

This assessment has followed the DPIE guideline *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW 2010) which recommends that a due diligence assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010) as a first step to identify whether Aboriginal objects or places are likely to be harmed by a proposed activity.

Based on the existing environment, an archaeological site inspection and impact assessment of the project disturbance footprint, this assessment concludes that Aboriginal objects are unlikely to be harmed by the project and further investigation beyond the scope of a due diligence assessment is not warranted for the project.

1.3 The site and study area

The site is approximately 19 hectares (ha) and is zoned RU1 Rural under the Liverpool Local Environmental Plan 2008 (Liverpool LEP). It is adjacent to the Western Sydney International Airport site. Commonwealth owned land which will form part of the Western Sydney Airport, bounds the eastern and southern boundaries of the site.

The Western Sydney Aerotropolis Planning Package shows the site and the surrounding land to the west of the Western Sydney Airport as within the proposed Agribusiness Precinct.

Under Division 1 of Schedule 1 of Sydney Regional Environmental Plan (SREP) No 9 – Extractive Industries, the site is identified as being a clay/shale extraction area of regional significance.

The study area adopted for this assessment is shown in Figure 1.1.

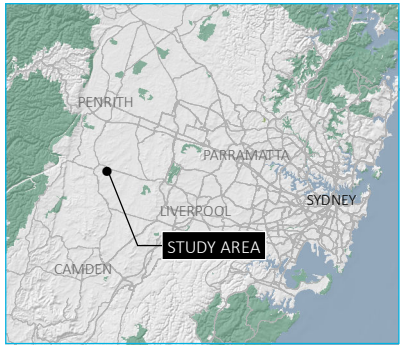
1.4 Description of the activity

As noted in Section 1.1, CPG/KLF propose to progress the proposed modification to reactivate the quarry. The scope of the proposed modification is described in detail in Chapter 2 of the Proposed Modification Report (EMM 2020) and summarised as follows:

- a change to the quarry access arrangements;
- extension of an existing stockpiling area to the west of the quarry footprint;
- establishment of a new equipment laydown area;
- establishment of a new office and weighbridge; and
- an extension to the period of quarrying operations.

The creation of a new stockpiling area and the creation of new site infrastructure, such as the weighbridge, will result in new ground disturbance. However, quarrying activities and use of the existing road will not result in new ground surface disturbance as they will occur within the existing disturbance footprint.

The proposed project layout is shown in Figure 1.2.



KEY

- Study area
- Western Sydney Airport
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- NPWS reserve (see inset)
- State forest (see inset)

Source: EMM (2020); DFSI (2017); ASGC (2006); Nearmap (2020)

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Location and study area

Luddenham Quarry - Modification 5
Aboriginal Heritage Due Dilligence
Figure 1.1

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Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

Proposed modification

Luddenham Quarry - Modification 5
Aboriginal Heritage Due Dilligence
Figure 1.2

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1.5 Legislative context

1.5.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1974* (EP&A Act) provides the statutory framework for the environmental impact assessment of development in NSW. The statutory trigger for development consent is provided for under section 4.2(1) of the EP&A Act.

The consent is proposed to be modified under Section 4.55(1A) of the EP&A Act. The proposed modification is considered to be substantially the same development for which the consent was originally granted and is of minimal environmental impact.

Although Aboriginal cultural heritage values are required to be appropriately assessed and managed for SSD developments, an Aboriginal heritage impact permit (AHIP) is not required to harm Aboriginal objects or places. Instead Aboriginal cultural heritage values are typically managed through an Aboriginal heritage management plan (AHMP) prepared to the satisfaction and endorsement of DPIE.

1.5.2 National Parks and Wildlife Act 1974

Aboriginal objects and places are protected in New South Wales (NSW) under Part 6 of the NSW *National Parks and Wildlife Act 1974* (NPW Act). Section 90 of the NPW Act requires an Aboriginal heritage impact permit (AHIP) for harm to an Aboriginal object or Aboriginal place. Significant penalties are in place for harm to Aboriginal objects or places or regardless of whether the harm was committed knowingly or not. Defences against prosecution include impacts in compliance with an AHIP, acting in accordance with specified codes of practice or the conduct of certain low impact activities. The Act defines an Aboriginal object as:

> any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

Harm is defined as:

> any act or omission that: (a) destroys, defaces or damages the object or place, or (b) in relation to an object—moves the object from the land on which it had been situated, or (c) is specified by the regulations, or (d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c), but does not include any act or omission that: (e) desecrates the object or place, or (f) is trivial or negligible, or (g) is excluded from this definition by the regulations.

1.5.3 National Parks and Wildlife Regulation 2009

The NSW National Parks and Wildlife Regulation 2009 (NPW regulation) is subsidiary legislation made under its parent act, the NPW Act. The *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (due diligence guidelines) (DECCW 2010) is adopted by the NPW Regulation under Clause 80A. Compliance with the due diligence guidelines provide a defence for harming Aboriginal objects and places.

The due diligence guidelines provide a generic code of practice used to determine whether activities will harm an Aboriginal object and, if so, what measures can be taken to avoid that harm. A summary of the due diligence is shown in Figure 1.2.

The advantages of due diligence for assessing potential harm to Aboriginal objects are that it:

- provides a defence against prosecution for inadvertent impacts if the process is followed;
- assists in avoiding unintended harm to Aboriginal objects;

- provides certainty to land managers and developers about appropriate measures for them to take;
- encourages a precautionary approach; and
- results in more effective conservation outcomes for Aboriginal cultural heritage.

If the due diligence assessment determines that Aboriginal objects or places are likely to be harmed, an AHIP is required to manage harm as defined by Part 6, Section 86 of the NPW Act.

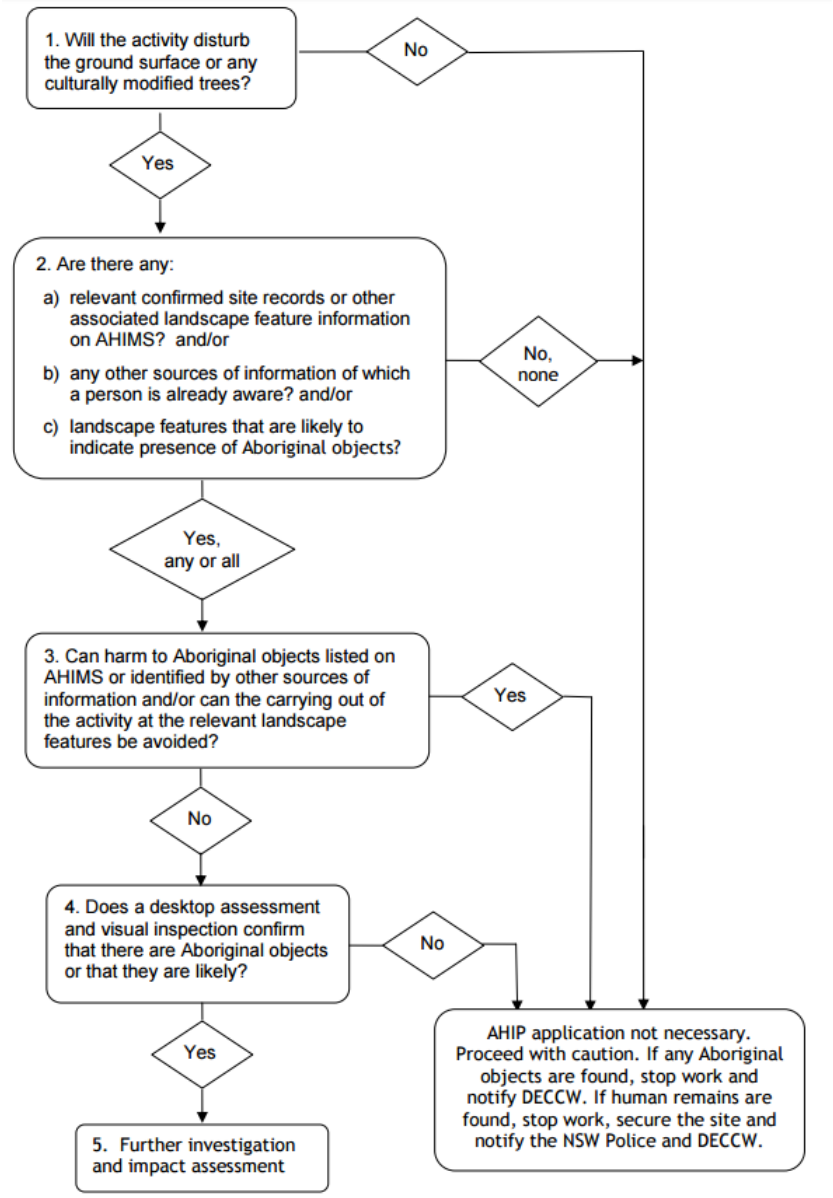


Figure 1.3 Due diligence process summary (source: due diligence guidelines (DECCW 2010)

1.6 Existing consent and licences

The existing quarry on the site is approved by SSD consent DA 315-7-2003, issued by the NSW Minister for Planning under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This consent has been modified three times (MODs 1–3). A fourth modification application (MOD 4) was withdrawn. The consent includes quarry components that are on Commonwealth-owned land, which was leased by the previous operator, including the site access road, quarry support facilities and stockpiling areas. The quarry components on Commonwealth-owned land, in particular the site access road, are no longer available for use by the quarry.

The consent allows quarrying with a production rate of 300,000 tonnes per annum (tpa) until 31 December 2024, although rehabilitation may continue after this. The NSW Department of Infrastructure, Planning and Natural Resources (DIPNR) Assessment Report for the original quarry states that a separate application will be required for the approval of rehabilitation activities.

The quarry is a scheduled premise covered by Environment Protection Licence (EPL) 12863. This EPL has been suspended. Consultation will be carried out with the Environment Protection Authority (EPA) to determine whether reactivation and subsequent variation of this EPL or application for a new EPL is appropriate.

As clay/shale are classified as a 'mineral', therefore the quarry is classified as a mine requiring a mining lease (ML). This ML application process for the quarry has not been completed. CPG and KLF are in the process of transferring this application from the original applicant prior to determining whether to continue with this application or start a new ML application.

1.7 Assessment methods

This assessment has been completed in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010).

In summary, the assessment involved:

- a search of the Aboriginal Heritage Information System (AHIMS) database to identify whether registered Aboriginal sites are present within the project area;
- consideration of existing regional and local Aboriginal cultural heritage studies;
- consideration of the environmental context of the project area to assess the likelihood of Aboriginal objects or places being present;
- a visual site inspection of the project area completed by an EMM archaeologist to identify any Aboriginal objects or areas of potential archaeological deposit (PAD) are present or likely to occur within the project area; and
- determination of whether further heritage investigation and impact assessment is required to explore whether Aboriginal objects would be impacted by the proposed modification.

1.8 Authorship

This report was written by Pamela Chauvel (Consultant Archaeologist, BA Archaeology), who also inspected the site; and it was reviewed by Ryan Desic (Associate Archaeologist – Heritage Team Leader, BA Hons Prehistoric and Historical Archaeology).

2 Environmental context

2.1 Overview

An overview of the environmental context of the study area is as follows:

- The study area is characterised by undulating Cumberland Plain topography that is widely documented to have been used by Aboriginal people in the past. There is no evidence of significant elevation, escarpments or exposed sandstone, which constrains a range of archaeological site types.
- The study area is bounded to the east by Oaky Creek, a third order stream, that would have been attractive to Aboriginal people in the past.
- High levels of historic land use and disturbance has occurred over the last 200 years which has resulted in de-vegetation and modification of waterways (usually in the form of dams). Much of the study area is disturbed by the quarry and stockpiles.
- There is limited evidence of remnant vegetation present, with the possible exception of the riparian corridors of Oaky Creek.

2.2 Rationale

The environmental context is used to predict the spatial distribution, preservation and likelihood of archaeological material. Landscape features were an important factor for the choice of camping, transitory and ceremonial areas used in the past by Aboriginal people. Natural resources, including raw stone materials and local flora and fauna, would have provided food, tools and material resources. These resources are linked to the topography, hydrology, geology and soil types in the region. Additionally, natural and cultural (human-made) site formation processes influence the present location of archaeological material (eg if moved through disturbance), along with its preservation and archaeological integrity.

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

2.3 Landform and topography

The study area is situated within the Sydney Basin bioregion and Cumberland Lowlands region. It is characterised by gently undulating rises with broad rounded crests and ridges in a rain shadow area below the Blue Mountains.

The study area is located on Wiannamatta Group shales formed on the Ashfield and Bringelly Shales. There is no outcropping of the underlying rock and Aboriginal site types, which are commonly found on sandstone formations, such as grinding grooves and rockshelters are unlikely to occur.

The study area has a gently inclined slope with a gradient of less than 5% and local relief is up to 30 m.

2.4 Hydrology

The study area is within the upper reaches of the Hawkesbury River catchment, adjacent to the Nepean catchment boundary. The eastern boundary of the study area follows Oaky Creek, a third order stream, which runs from south to north to join Cosgroves Creek outside the study area, to the north of Elizabeth Drive. The catchment for Oaky Creek is small and water persists in the creek for only a few weeks after rain (Dean-Jones 1991). A dam has been constructed on Oaky Creek in the north-east corner of the study area and collects surface water runoff from the property.

Hydrological features are the most likely to indicator of archaeological potential within the study area. Access to water and the natural resources associated with it will have dominated the distribution of habitation throughout the area. This is corroborated by previous archaeological works in the area and ethnographic accounts of the area.

2.5 Geology and soils

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

The study area is situated on the Blacktown (bt) soil and Second Ponds Creek (spz) soil landscapes which are defined in the *Soil and Land Resources of the Hawkesbury-Nepean Catchment* (DECCW 2008). Blacktown soil landscape comprises the western portion of the study area (Figure 2.1). Geology typically consists of laminate shales and siltstone, with underlying sandstone of fine to medium grained quartz. Outcropping does not occur naturally on the surface however can become exposed as a result of extensive land use disturbances and accelerated erosion. Soils comprise up to 30 cm friable loam to clay loam (A1 Horizon), overlying 10–30 cm of clay loam to silty clay loam hard-setting A2 Horizon. Subsoils are 40–100 cm of light to medium clay B2 Horizon subsoils with fine to coarse gravel size shale fragments. Silty clay to heavy clay usually occurs as deep subsoil above shale bedrock (B2 or C Horizon).

The eastern part of the study area is situated on the Second Ponds Creek landscape which is found on the footslopes and plains on colluvium/alluvium and Wianamatta Group Shale in the Cumberland Plain. Soils are yellow podzolic rock outcropping is nil. Local relief of this landform is low (5−30 m) with slopes of less than 3%.

Low relief and low slope areas would have originally presented as favourable for Aboriginal occupation; however, for the same characteristics these areas have been targeted for agricultural land use and as such exhibit extensive levels of disturbance.

2.6 Vegetation

The area comprises cleared open forest and woodland. The original woodland and open forest were dominated by Eucalyptus trees including *Eucalyptus tereticornis* (forest red gum), *E. crebra* (narrow-leaved ironbark), *E. moluccana* (grey box) and *E. maculata* (spotted gum). Today the study area has been extensively cleared and farmed. While the remaining vegetation along Oaky Creek forms a riparian corridor along the eastern boundary and has been subject to less disturbance, a section of the creek has also been dammed which has changed the water flow.

2.7 Land use history

Early land use consisted of forestry and grazing in the wood and scrubland of the Cumberland Plain. Settlement expansion and the search for suitable agricultural land soon led to the establishment of Parramatta and Liverpool townships, driving the development of Sydney's west as a key area for pastoral and agricultural exploitation. Land use and associated disturbance of the study area has accelerated from the early nineteenth century onwards, with the study area included in an initial land grant to John Blaxland of 6,710 acres in 1813.

In recent years, the study area has been used as a dairy farm, trotting track and rubbish dump. It has been subject to extensive vegetation clearance, and earthworks for water management and for the quarry. Plate 2.1 shows land use within the study area prior to 1991. At this time, the northern part of the study area was a former turf farm which means that repeated topsoil stripping is likely to have removed any potential archaeological deposit from the A1 soil horizon. To the south-west were horse yards and stables, while a rubbish dump and fill with bulldozed margins for a trotting track were located on the eastern side of the study area. Construction of the track involved excavation of a large dam, building up an embankment on the eastern end, and the addition of fill along the southern side near the creek (Dean-Jones 1991). All these activities would have had a significant impact on any surface or sub-surface archaeological resource.

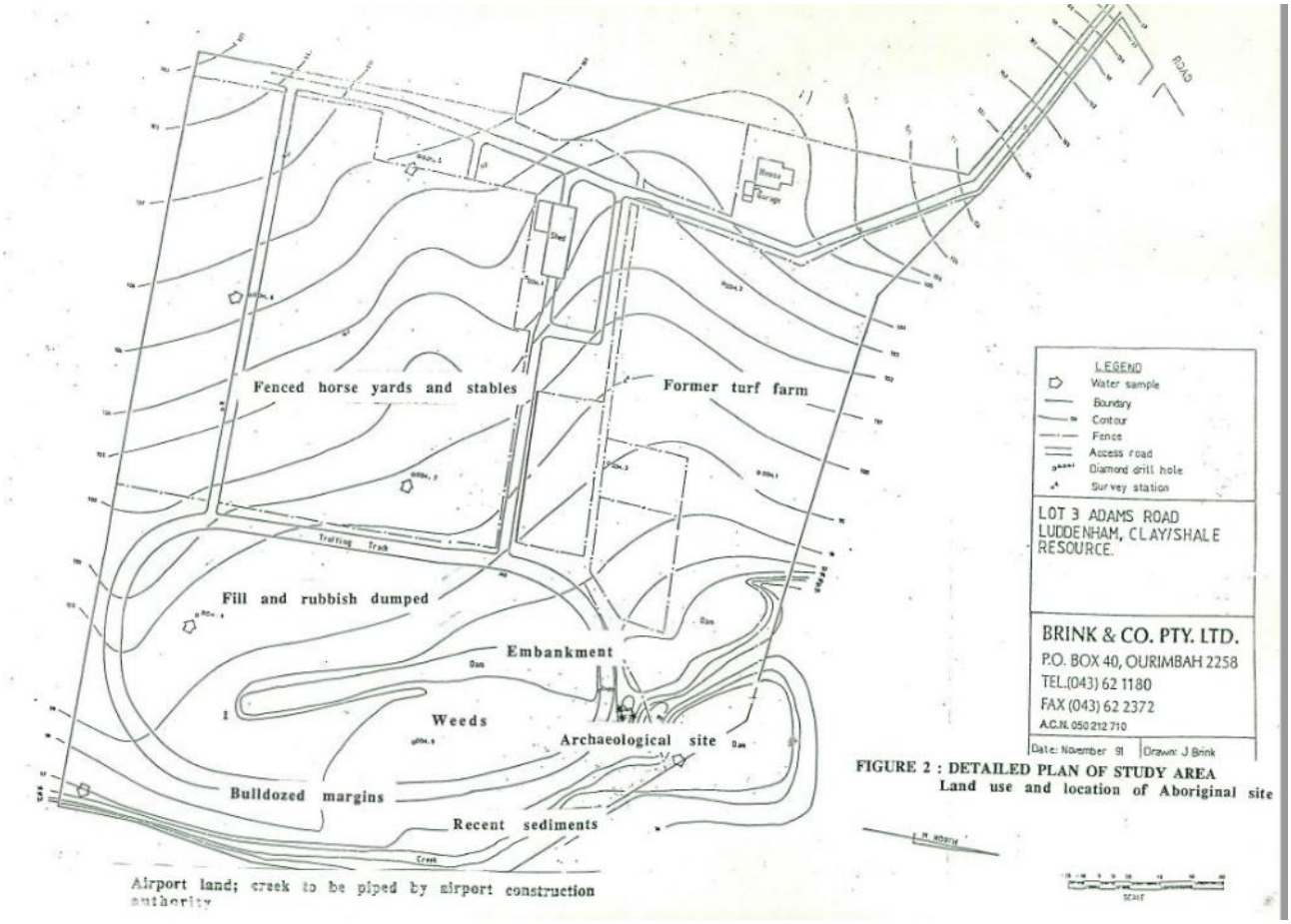
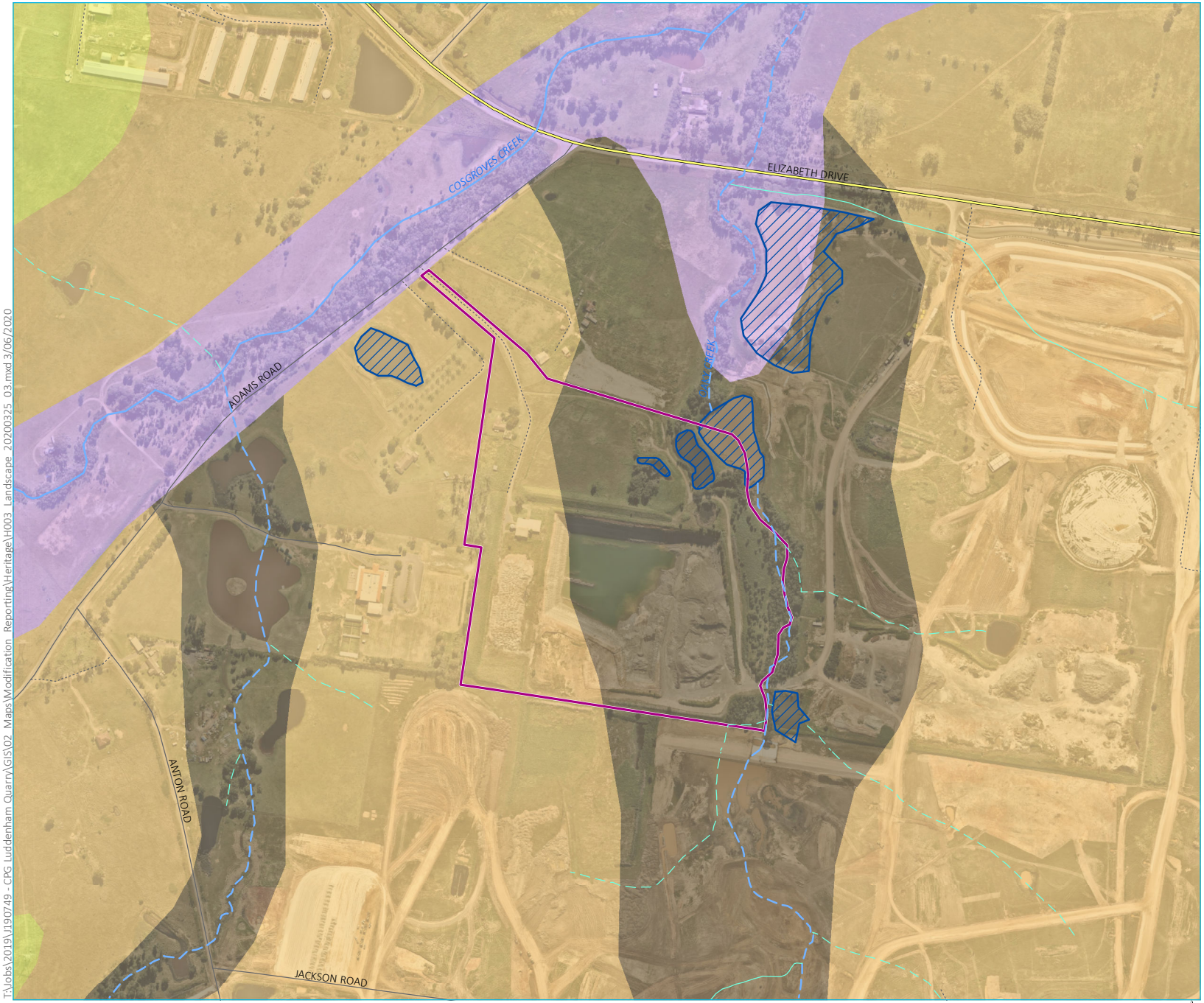


Plate 2.1 **Map of the study area showing land use in 1991. Note that the map is rotated, and north is to the right. (Source: EIS Appendix 7, Pam Dean-Jones 1991)**

More recent disturbance has been most intensive in the southern half of the study area with the establishment of a clay/shale quarry which was approved in 2003 (Figure 1.2). The quarry extraction footprint is bordered by a stockpiling area and earth noise bund to the west, an earth bund to the north and internal access roads to the south and east.

More specific details of land use and disturbance levels are provided in the site inspection results section (refer section 4.2).

Plate 2.2 Existing quarry, view north east



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Source: EMM (2020); DFSI (2017); Nearmap (2020)

Landscape, hydrology and soils

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Figure 2.1

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3 Archaeological context

3.1 Key findings

A summary of the key findings concerning the archaeological context of the study area is provided below.

- A large number of previous archaeological studies have been undertaken within, or in close proximity to the study area. Of note are extensive works for Badgery's Creek airport site encompassing much of the south-east of the study area.

- These studies indicate that elevated areas – terraces, levee banks, low hills – adjacent third and fourth order creeklines formed a focus for past Aboriginal activity, and that sites are generally located within 100 m of these creeks. Cultural material is found in a range of other environments but will often reflect transient use.

- Some 115 Aboriginal sites have been documented within the general area; one is within the study area. This AHIMS spatial coordinates for this site are incorrect. A site inspection confirmed the correct location of the site which is situated outside the disturbance footprint. Apart from two culturally modified trees and a grinding groove site (all outside of the study area), all previously recorded sites in the AHIMS search area are characterised as artefactual sites of surface and/or subsurface stone artefact deposits.

3.2 Ethno-historical background

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

Over thirty separate Aboriginal groups populated the wider Sydney Basin in 1788 CE, each with their own country, practices, diets, dress, and dialects. We now know of these groups as 'clans' and each identified with broader cultural-linguistic groups known as 'tribes. The study area sits within Darug clan country which extended from around Parramatta through to the Blue Mountains and from the Hawkesbury River in the north to Appin in the south. The many rivers acted as natural demarcation of this area and the flat terrain of the Cumberland Plain was favourable to the livelihood of the peoples.

> The inland clans fished for mullet and eels in rich lagoons, but much of their food came from yams dug out from the riverbanks and worms known as 'cah-bro' extracted from river driftwood. Colebee and Balledery called these people the 'climbers of trees' after their practice of skilfully ascending gums in pursuit of animals, cutting footholds in the trunks with a stone axe." (Collins 1798)

The central location and ease of movement through this area thanks to suitable topography meant that Darug country was a frequented by travelling groups and used as a place of meeting. "Corroboree" the word for meeting and ceremony now associated with Aboriginal meetings in the modern era stems from the Darug language group (Troy 1994).

Environmental conditions in this region throughout the last 10,000 years were relatively stable and evidence suggests that population densities pre contact were high (Williams 2013). In the late eighteenth century smallpox and other European diseases are likely to have wiped out a significant percentage of Aboriginal peoples (>50%). In May 1789 William Bradley recorded the 'dreadful havoc' that smallpox had wrought amongst Aboriginal communities: 'we did not see a Canoe or a Native the whole way coming up the Harbour and were told that scarce

any had been seen lately except laying dead in and about their miserable habitations' (Bradley 1969). Traditional burial practices broke down and clans merged as entire communities were taken by the virus (Hunter 1793). The impact of smallpox and other European diseases continued to ripple across the country, reducing communities in the Hunter 'from about 200, to 60' (Backhouse, 1843, p. 401). This is large scale decrease in population accounts the discrepancies seen between the distribution of archaeological remains and the ethnographic accounts of Aboriginal populations.

The Cumberland Plain was a point of first contact between many Aboriginal peoples and the Europeans, the same environmental factors that supported Aboriginal peoples also made for favourable lands for settlement and agriculture. The expedition by Governor Phillip to Prospect Hill in 1788 found the lands to the west more agreeable to farming than those of the Sydney Cove area and the township of Rose Hill (renamed Parramatta the following year) was established and settler colonialism rapidly expanded the European footprint in the area. Competition for resources quickly flared tensions, with violence escalating throughout the region. On 1 May 1801 Governor King issued a public order requiring that Aboriginal people around Parramatta, Prospect Hill and Georges River should be 'driven back from the settlers' habitations by firing at them'.

The conflicts and subsequent reprisals by both sides spread across the region and would eventuate in the Appin Massacre, 1816; these actions would come to be known as the Cumberland Plain war. The area was not only a site of conflict but also served as an important reconciliation place even as early as 1805 during a meeting organised by the reverend Samuel Marsden and the local tribes in a bid to cease the hostilities between settlers and Aboriginals.

3.3 Regional archaeological overview

The first peopling of Australia occurred ~50 kilo annum (ka), and likely consisted of reasonably large groups of technologically advanced hunter-gatherers (Bradshaw et al. 2019; O'Connell et al. 2018). The peopling of the continent was rapid, with sites such as Devil's Lair (WA), Warratyi (SA), and Lake Mungo (NSW) all occupied within a few thousand years of arrival (Bowler et al. 2003; Hamm et al. 2016; Turney et al. 2001). Genomic research has shown that following these initial explorations of the continent, regional populations or nomadic sedentism, was established by ~40 ka (Tobler et al. 2017). These small populations were highly mobile, but remained within a broad spatial geographic area, dictated in general by the nature of resources and water availability. In the case of some of the arid parts of the continent, mobility encompassed thousands of square kilometres (Gould 1977), while major riverine corridors such as the Murray River had near permanent settlements (Pardoe 1993).

In NSW, the earliest evidence of Aboriginal people are human remains recovered from the lunette in Lake Mungo and dating to ~42 ka (Bowler et al. 2003; O'Connell et al. 2018). The presence of red ochre covering the remains representing a society with significant cultural and symbolic complexity (Langley et al 2011). Near the coastal edge, the earliest populations were found at Cranebrook Terrace, near Penrith (Western Sydney). Here a handful of rudimentary stone tools were found in an alluvial unit, some 8m below the current surface, which were dated to ~40–45 ka (Williams et al. 2017). However, it is not until ~35 ka, that regional populations appear to have become established in the Sydney Basin, and which appeared to consist of small bands of people focussed mainly along major river systems, including the Hawkesbury-Nepean River, Georges River, and Hunter River (Hughes et al. 2014; Williams et al. 2012, 2014). These rivers formed key ecological refuges that hunter-gatherer groups used to survive major climatic events such as the Last Glacial Maximum (21±3 ka) – a cool and arid climatic period. Well-established archaeological models suggest populations experienced a major reduction in size (by as much as 60%), and settlement contraction and abandonment across much of the continent during this time (Veth 1993; Williams et al. 2013). Although recent research suggests that the story may be more complex than this (eg Tobler et al. 2017).

The terminal Pleistocene and early Holocene (~18–8 ka) was characterized by significant environmental change, notably the rapid inundation of much of the coastal shelf, resulting in the reduction of the continent by ~21% (~2 million km^2) (Williams et al. 2018), in tandem with improving climatic conditions – the Holocene climatic optimum (Williams et al. 2015a, 2015b). More broadly, these conditions resulted in increasing population growth, expansion of ranging territories, increasing sedentism (longer patch residence time) and the beginnings of low-level

food production (eg aquaculture), and ultimately the initiation of social and cultural groupings observed in the late Holocene (Williams et al., 2015b). Within the Sydney Basin, a large number of sites are first initiated during this time, including Burrill Lake (~20 ka), Bass Point (~17 ka), and Loggers Shelter in Mangrove Creek (~11 ka) (Bowdler 1970; Lampert 1971; Attenbrow 2004; AMBS 2006, p.87). More broadly, we see a much broader range of archaeological site types occurring, such as the Roonka Flat burial ground on the banks of the Murray River within which some 147 individuals were interred through the Holocene (Pate et al. 1998), and the increasing use of marine resources. Many of the previous refuges were subject to abandonment or a re-structuring of land use (Dortch 1979; Fitzsimmons et al., 2019). These activities suggest the ability to undertake large-scale movements to mitigate environmental distress was becoming increasingly difficult and was addressed through diversification of hunter-gathering behaviours and, at least in part, technological advances and investment (Williams et al. 2015b).

The late Holocene saw significant population increase, with hunter-gatherers reaching their zenith of ~1.2 million at 0.5 ka, a tenfold increase on Pleistocene levels (Williams, 2013). Data suggests that the highest populations during this time were in the south-east of Australia. Williams et al. (2015) suggest that this increase was likely a result of intensification of earlier technological advancements, including hafting-technology, plant and seed processing, and localized landscape management (using fire), allowing climatic downturns to be successfully weathered. These included strong arid El Nino Southern Oscillation (ENSO) conditions between 4−2 ka, and increasingly turbulent climatic conditions during the Medieval Climatic Anomaly (1.3−1 ka) (generally wetter) and Little Ice Age (0.3−0.5 ka) (generally drier) (Williams et al. 2010, 2015b). A result of these denser populations was decreasing freedom of movement and the formation of strong classificatory kinship systems, complex cultural and symbolic landscapes based on geographic totemism (the 'Dreaming'), distinctive graphic art systems, land rights in the form of ritual property, and formalized exchange networks (Williams et al. 2015b). For the Sydney Basin, these conditions resulted in a significant increase in the archaeological visibility of past Aboriginal populations, with sites occurring in a much wider range of locations; and generally indicative of a more intensive use of the landscape.

There have been an extensive number of archaeological investigations on the Cumberland Plain in the last four decades. Most of these investigations have been in response to the continual spread of urban development throughout the greater Sydney region. With an increasingly large dataset available, predictive models for Aboriginal sites have been established and continually tested, developed and refined. The predictive models have formed from archaeological surveys and excavations which are discussed below.

3.4 Local studies

The most relevant archaeological investigations of the study area are a study undertaken in 1991 for an earlier Environmental Impact Statement (EIS) and an assessment for Badgery's Creek airport site in 2016 that encompassed the current study area. Relevant assessments are summarised in the following sections.

3.4.1 Archaeological assessment of the study area (Dean-Jones 1991)

In 1991 an archaeological survey of the study area (Dean-Jones 1991) was undertaken as part of an EIS to support an earlier application for Luddenham Quarry. Ground surface visibility was higher than it is today, with 70% visibility in the horse yards, 40% in the north-west paddock and 20% along Oaky Creek.

One archaeological site was located during the survey (#45-5-2280) (Figure 3.1). It was identified on the banks of a dam, within an area that would originally have been on the edge of the floodplain of Oaky Creek (see Plate 2.1). The site comprises a surface scatter of 22 flaked stone artefacts of indurated fine sandstone and mudstone. However, the assessment determined that the artefacts were not *in situ*. They were scattered around the shoreline of a small pond created by fill and dam construction. No artefacts were identified as having retouch and on the whole, if cortex was present, it occurred on 10% of less of the artefact's surface. The medium density stone artefact scatter was deemed to be the remnant of a much larger site that had been destroyed by past earthworks. Moreover, the report concluded that site #45-5-2280 had low scientific, educational and cultural significance because of the disturbed landscape context.

The report predicted that the probability of other sites being present within the study area was low. The area around #45-5-2280 has subsequently been fenced to prevent vehicle access, and stormwater or other discharges being directed across the site (Plate 4.9).

Importantly, the report assessed that:

> Because of this land use history, preservation of archaeological evidence is considered unlikely over almost the entire property. A small area of relatively intact lower footslope colluvium remains in the north eastern corner, surrounded by earthworks associated with dam construction (Dean-Jones 1991, p.3-4).

Therefore, the only areas of relatively undisturbed ground surface within the study area are located in the north-east around the margins of existing dams. It is possible for ground surface exposures to occur due to past earthworks and fluctuating water levels in the dams.

3.4.2 Environmental Impact Statement (Nicolaisen 2003)

In 2000, Umwelt conducted an Aboriginal assessment, in consultation with the Gandangara Local Aboriginal Land Council (LALC) (Nicolaisen 2003, p60-61). During the site inspection, #45-5-2280 was re-located. The assessment determined that the condition of the site had not deteriorated significantly since 1991, and that the site had moderately low scientific significance. However, it noted that the site is valued by the local Aboriginal community. Gandangara LALC requested that the site be conserved *in situ.*

The report recommended that the site by fenced and marked on all plans and design drawings for the quarry, and any subsequent uses of the property, as an area that is not to be disturbed. In addition, a protocol for the protection of the site should be included in the Environmental Management Plan for the quarry. The report concluded that no further archaeological investigation of the site relating to Aboriginal heritage was required prior to the development proceeding.

3.4.3 Badgery's Creek airport site

i Environmental Impact Statement (Navin Officer 1997)

In 1997, an archaeological investigation of two alternative potential airport locations was conducted by Navin Officer Heritage Consultants at Badgerys Creek and the Holsworthy Military Training Area. The Badgerys Creek study area comprised the composite footprint of the three airport options (Plate 3.1) and included the current study area. The assessment was based on Aboriginal cultural values reported by Aboriginal stakeholders and an archaeological survey of surface archaeological features.

During the 1997 EIS field survey program, 110 Aboriginal sites were identified, in addition to a previously recorded site (#45-5-0517), producing a total inventory of 111 recordings. The majority (92%) comprised surface artefact sites (44 isolated finds and 58 artefact scatters). These sites were characterised by low artefact numbers and low artefact densities. The number of recorded artefacts ranged from 2 to 31, with approximately half (46%) containing 3–5 artefacts and 22% containing only two artefacts. The remaining recordings consisted of eight scarred trees and an open potential archaeological deposit (PAD).

Just over half of the sites were assessed as having a moderate or high potential for *in situ* artefactual material. These were sites predominantly within fluvial corridor contexts. Thirty-one per cent of sites occurred on alluvial flats or valley floor contexts within the corridor zone. Crests and ridgeline zones contained proportionately low artefact densities (12%), with highest percentages (7%) occurring on minor watersheds situated close to fluvial corridor zones.

In summary:

- sites and varying artefact densities occur in all topographic zones;

- site density was found to be higher in topographies associated with permanent water sources;
- alluvial flats were a zone of high site density and appeared to have been a focus of Aboriginal occupation; basal slopes adjacent to valley floor contexts were also found to have relatively high site densities;
- sites in association with permanent water (secondary or higher order fluvial corridors) tended to be larger, and have higher artefact densities and greater technical complexity, than those associated with lesser order drainage lines;
- in line with the results of the Rouse Hill investigations (JMCHM 2005) all of the fluvial corridor zones were identified as zones of archaeological potential relative to adjacent topographies. These zones were considered likely to contain larger and more complex sites, as well as the least disturbed sub-surface deposits below the plough zone;
- ridgetops in general contained fewer sites; and
- minor gullies (ie drainage lines outside of fluvial corridors), tended to have low site densities.

ii Aboriginal cultural heritage assessment (Navin Officer 2016)

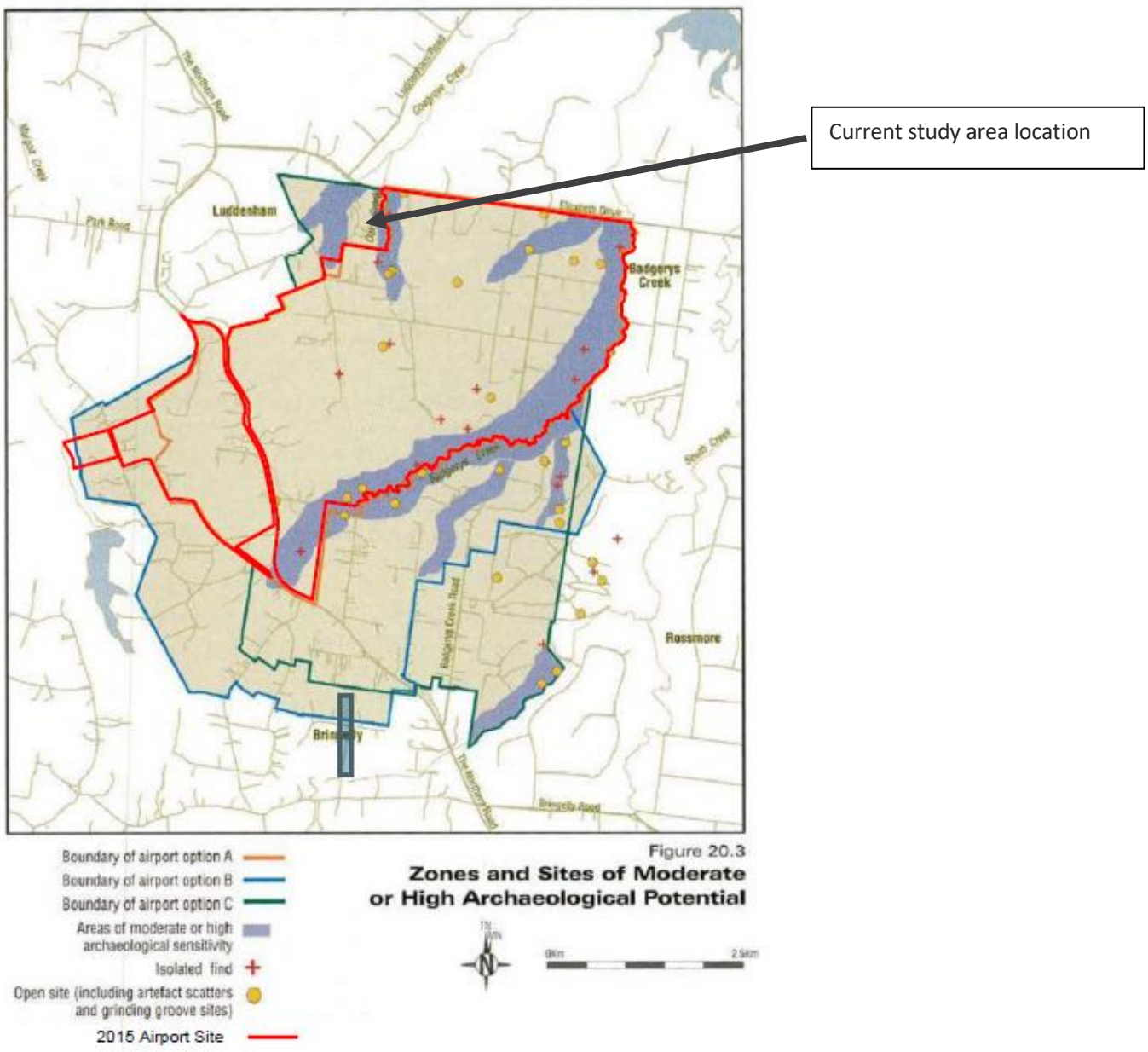
In 2016, Navin Officer completed an Aboriginal cultural heritage assessment (ACHA) including Aboriginal consultation, survey and a three week fieldwork programme of test excavation at the Badgerys Creek airport site. Their assessment incorporated the proposed 2015 airport site (outlined in red in Plate 3.1) which is adjacent to the current study area to the south and east. The report noted that Oaky Creek, within the current study area, was identified as an area with moderate or high archaeological potential in the 1997 EIS assessment for Badgerys Creek airport site (Plate 3.1).

Test excavation was conducted at 11 locations, resulting in 23 new recordings of Aboriginal sites. These comprised 9 recordings with surface artefacts only; and 14 recordings where subsurface artefacts were confirmed through test excavation. One previously recorded site was subject to test excavation which confirmed the presence of subsurface artefacts (#45-5-2665). Distribution was uneven and consistent with a random sampling of a population that is sparsely and unevenly distributed (p.102).

The depth of subsurface artefacts, typically in Western Sydney, occur in the top 30 cm. In valley floor deposits can be much deeper. Where there is a distinct clay layer, artefacts tend to move through the soil profile and rest just above the clay layer (Navin Officer 2016, p.238).

Artefacts recovered from the test excavation predominantly comprised unretouched flakes. Retouched flakes made up 12% of the assemblage and of these, the majority were backed artefacts. Only two of the 91 artefacts recovered during test excavation were cores. Raw materials identified within the stone artefacts recovered were predominantly silcrete, with vein quartz, igneous rock and fine-grained siliceous rock also present. The low proportion of cortex on the artefacts is consistent with an assemblage produced in a situation where people had limited access to raw material and intensively flaked and reduced the stone they did have.

The investigation found that proximity to water, and the size of nearby water sources, was the major factor influencing where Aboriginal groups chose to focus their activities. Artefact density increases with the size of nearby drainage lines (within 100 m). Other variables, such as elevation and valley context, that are also associated with changes in artefact density, are closely linked to the size of drainage lines in the landscape. The assessment found a consistent signal of increasing artefact density associated with proximity to water, and proximity to higher order drainage lines. They concluded that access to stable sources of water, and consequently plant and animal resources, associated with higher order drainage lines was the major determining factor in where Aboriginal activity was focused.



Source: Navin Office 2016 Figure 5.5

Plate 3.1 Zones and sites identified in the 1997 EIS assessment with predicted subsurface Aboriginal archaeological potential

3.4.4 Due diligence heritage assessment for stockpiling site at 285 Adams Rd, Luddenham (Epic 2016)

An Aboriginal due diligence assessment report was prepared in 2016, to support a modification (Mod 4) for the clay and shale quarry. The proposed modification involved the relocation of already approved stockpiling of excavated material to 285 Adams Road directly to the north of the study area, and the relocation of composting activities to the northern part of the current study area. The assessment reviewed landscape disturbance levels and the potential for Aboriginal objects within the proposed Mod 4 area.

The report noted that two archaeological assessments were carried out as part of the original Luddenham Quarry EIS during which an area adjacent to the Riparian Zone (within the previously approved site) was identified as containing items of Aboriginal Heritage. Consequently, this area is fully segregated and protected from the remainder of the site, fenced and locked. Access to this zone is available to authorised people and the Aboriginal community only. In addition, other sites of Aboriginal cultural values have been identified within the Commonwealth land east of Oaky Creek, but none were identified within the proposed Mod 4 area.

The report concluded the site was very disturbed and unlikely to have any place or object of Aboriginal cultural or archaeological value.

3.4.5 Mamre South Precinct State Significant Development (Biosis 2019)

Biosis (2019) prepared an Aboriginal cultural heritage assessment (ACHA) for a State Significant Development (SSD) at 657-769 Mamre Road, Kemps Creek, 7 km to the north-east of the study area. Their study included both surface and sub-surface investigations, and consultation with 19 Aboriginal organisations.

The assessment identified nine Aboriginal sites (MSP-01 to MSP-11 inclusive), all consisting of various densities of stone artefacts. Excavations across the site recovered 691 artefacts, of which 666 were recovered from MSP-02 (#45-5-5188), located on a high point some 100 m from South Creek (a sixth order stream). These artefacts were characterised as of late Holocene age, dominated by silcrete raw materials and a higher than average proportion of formal tool types. While excavations demonstrated that much of the site exhibited a ≤30 cm soil profile, occasional test pits in MSP-02 extended to 80 cm. Although even in these locations, artefacts were primarily found within the upper 40 cm (~98%).

This assessment demonstrated that artefact densities were generally low across most landforms in the local area, apart from at a single location within 100 m of a high order stream.

3.4.6 Oakdale South Estate (Artefact 2015) and Oakdale West Estate (Artefact 2017)

Oakdale precinct is a development of industrial properties, approximately 9 km north-east of the study area. Oakdale West lies to the west of Ropes Creek (a third order stream) and Oakdale South lies to the south-east of a tributary. Findings by Artefact's test excavation at Oakdale South in 2015 are applicable to the study area and offer a model of the archaeological potential within the precinct.

The Oakdale South investigations included a series of test excavations conducted within areas identified as of archaeological significance. These included tributaries to Ropes Creek and in proximity to previously identified sites. A total area of 27.5 m^2 was excavated and identified a soil profile commonly about 60 cm in depth. These soil profiles were consistent with a shallow duplex or fabric contrast soil, demonstrating a pale grey loam topsoil (A1 horizon) grading into a hard, brownish orange clay subsoil (B2 horizon). Some 341 artefacts were retrieved during test excavation primarily from the upper 20 cm, resulting in an overall artefact density of 12.29 artefacts/m^2.

The report concluded that the results reflected a transient use of the region by Aboriginal people in the past, with only one testing area revealing higher densities. Specifically, some 49 artefacts were recovered from a single test pit, although other densities were generally <10/m^2.

A subsequent stage of work was undertaken for Oakdale West Estate. This consisted of a desktop review and field survey of the site and documented eight sites, all consisting of artefact scatters and/or isolated Aboriginal objects. In general, none of these sites exceeded 5 artefacts in a single locale, and most were in disturbed locations. However, the sites were primarily adjacent to Ropes Creek, and the report ultimately identified a large area of archaeological sensitivity along this tributary.

3.5 Aboriginal Heritage Information Services (AHIMS)

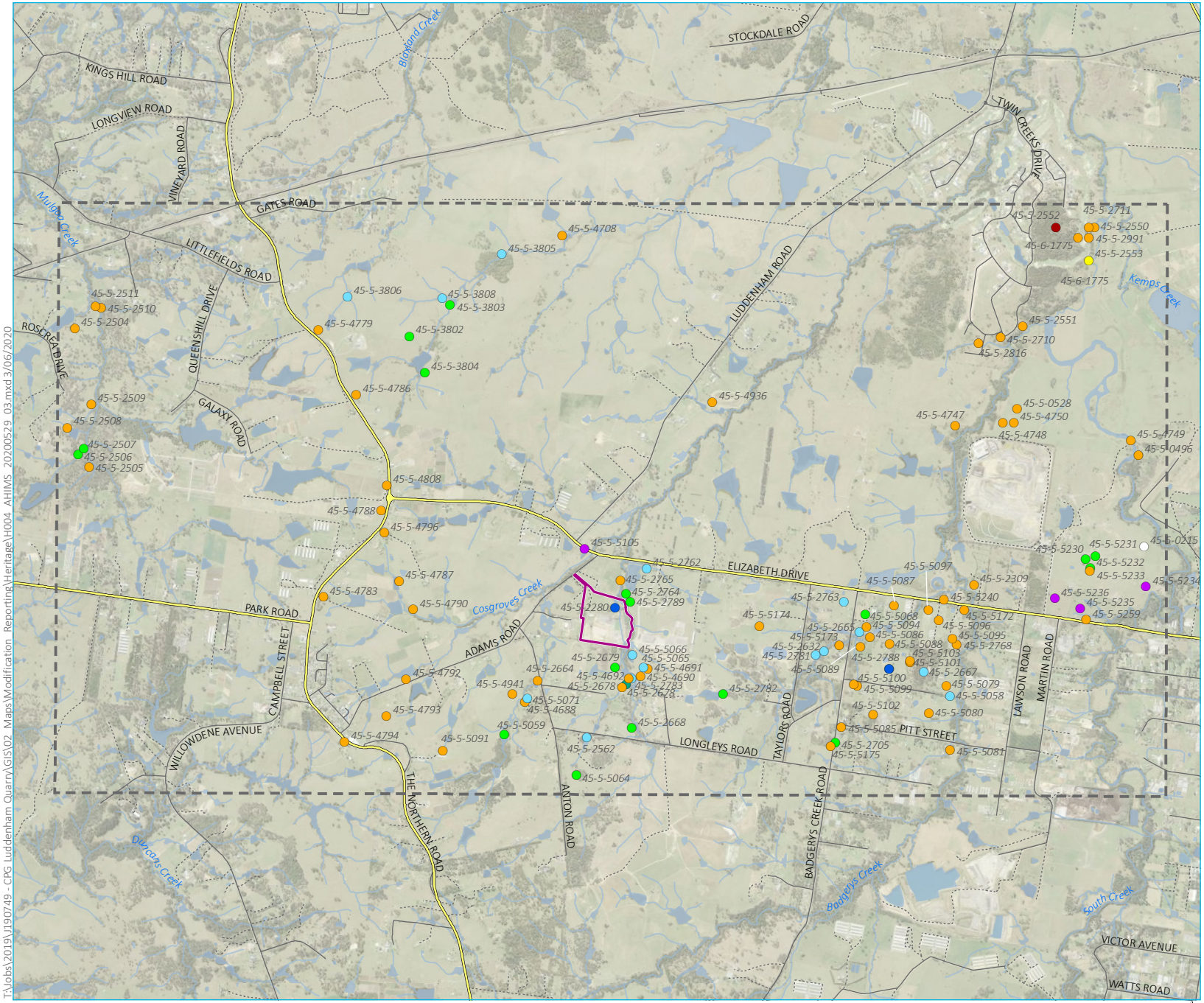
A search of the AHIMS database on 20 January 2020, identified 110 sites within a 10 x 5 km search area centred on the study area (refer to Figure 3.1 and Appendix A).

Apart from an axe grinding groove site, two culturally modified trees and four areas of potential archaeological deposit (PAD), all the sites identified in the search area were artefactual sites (n=103). Culturally modified trees are rare in the local area owing to the high level of land clearance. A summary of the site types recorded on AHIMS is provided in Table 3.1.

The only registered AHIMS site within the study area is Oaky Creek 1 (#45-5-2280), a medium density artefact scatter identified in 1991 (Dean-Jones 1991). See Section 4 for a site description.

Table 3.1 AHIMS site results

Site type	count
Axe grinding groove	1
Culturally modified tree	1
Culturally modified tree, undefined artefactual site	1
Artefact sites	103
- *Isolated Find*	- *17*
- *Low density artefactual site (<10)*	- *16*
- *Low density artefactual site (10-20)*	- *1*
- *Medium density artefactual site (20-50)*	- *2*
- *Undefined artefactual site*	- *67*
Potential archaeological deposit	4
TOTAL	**110**



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AHIMS search results

Luddenham Quarry - Modification 5
Aboriginal Heritage Due Dilligence
Figure 3.1

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3.6 Site predictions

Based on the distribution of sites and finds by previous investigations and the AHIMS data, a number of predictions in relation to cultural material within the study area can be developed.

At a generic level, the criteria as outlined in DPIE's The *Due Diligence Code of Practice* (DECCW 2010) can be utilised, which includes:

- within 200 m of waters;
- located within a sand dune system;
- located on a ridge top, ridgeline or headland;
- located within 200 m below or above a cliff face; or
- within 20 m of or in a cave rockshelter or cave mouth; and
- is on land that is not disturbed.

The data presented in Section 3 and 4 are not significantly different from these criteria. However, they can be further refined. Of note is that while cultural material is often found in the vicinity of water, it is more commonly located on third and fourth order creeks, and less so on smaller tributaries. The ACHA completed for Badgerys Creek site that adjoins the study area (Navin Office 2016) found that sites occurred most frequently within 100 m (rather than 200 m) of reliable, higher order streams. While results do not support significant deposits being present on ephemeral creeklines, a medium density artefact scatter has been identified on Oaky Creek, and as such, may contain additional cultural material (although in lower densities than would be expected adjacent to higher order creeks). It is also worth highlighting that the land around Oaky Creek has been subject to land clearance and water management, including the construction of dams may have altered the course of the steam from pre-contact times. In addition, Cosgroves Creek, which is outside the study area to the west of Adams Road, is approximately 200 m from the proposed activity (specifically, the weighbridge, office and equipment laydown area).

In summary, prior to modern land-use disturbance, the study area was likely to have contained low to moderate subsurface artefact densities within 100 m of Oaky Creek. However, land use disturbance has extensively disturbed the land within 100 m of Oaky Creek through dam construction which has exposed stone artefacts not *in situ* in a small area directly next to the stream channel. Also, within 100 m of Oaky Creek, is an existing vehicle track. The proposed project disturbance footprint within the study area is over 200 m from Oaky Creek and has been subjected to repeated topsoil disturbance from its use as a turf farm and the construction of a dam. As such, Aboriginal objects are unlikely to occur generally in this area and are even less likely to be traceable through archaeological investigation.

4 Site inspection

4.1 Overview

On 30 January 2020, EMM archaeologist Pamela Chauvel completed a visual inspection of the study area. This involved walking over the accessible areas of the site and recording landscape information, as well as targeting ground exposures for the presence of Aboriginal objects.

The main aims of the inspection were to:

- identify Aboriginal sites and/or potential Aboriginal places;
- characterise the landscape to aid predictions of subsurface archaeological potential; and
- assess the potential impacts of the proposed development.

4.2 Results

The study area gently slopes from the west to east. It is bounded to the east by Oaky Creek and, within the study area, this section has been the least disturbed from previous mining and agricultural activities. The northern part of the study area, and a narrow corridor on the western boundary, have been cleared for agricultural use. Assessment of this area was impeded by extremely low visibility at the time of survey. Grass covered most of the study area, limiting ground surface exposure (Plate 4.1). One eucalypt tree, within a grove of Grey Box Forest Red Gum grassy woodland near the western boundary, bore an even, oval shaped scar. Trees in this area had been affected by dieback; although the tree with the scar is alive, and the scar, which is 1 m in length, retains a dry face. However, the tree is not considered to be culturally modified and cannot be classified as a scar tree. Not only is the survival of scar trees extremely rare in the local area (Table 3.1) because of the historically high level of vegetation clearance, but the tree itself is quite young. It is likely that the scar has been caused by termite activity or incidental damage (Plate 4.2; Plate 4.3). Furthermore, it is outside the proposed activity and will not be impacted by the development.

The majority of the study area is dominated by the clay/shale quarry, not only the mine itself but the bund walls and stockpiles that surround it (Plate 4.4). These areas of disturbance have rendered the probability of Aboriginal artefacts surviving in intact contexts as negligible. If artefacts were to be identified, it is highly unlikely they would be *in situ* in the southern half of the study area.

However, the eastern corridor of the study area, encompassing the riparian zone on the west side of Oaky Creek, has been less disturbed (Plate 4.5). Site inspection confirmed the assessment of previous reports (Navin Officer 2016) that this area has higher potential for Aboriginal cultural material to be present. However, it should be noted that a series of dams and earthworks, in the north-east corner of the study area, has impacted the flow of Oaky Creek and disturbed the ground surface. At the time of the site inspection, Oaky Creek was dry. Ground surface visibility was limited by a dense coverage of casuarina needles. An access track that runs north to south between the quarry and Oaky Creek has been raised and levelled with introduced fill (Plate 4.6).

The one recorded AHIMS site in the study area (#45-5-2280) was inspected. However, the site inspection found that the spatial coordinates on the AHIMS database do not match its physical location in the study area (Plate 4.7). The recorded AHIMS location was inspected and found to have a high level of disturbance from creation of the road, the dam walls and a nearby noise bund. High grass limited the ground surface visibility. No artefacts were identified. Approximately 50 m to the east of the recorded AHIMS location is a fenced area that marks the true location of the AHIMS site. The corrected location of #45-5-2280 is shown on Figure 4.1. The securely fenced area is located beside

Oaky Creek and contains an area approximately 2.5 m x 6 m (Plate 4.8). At the time of the site visit, the ground was covered in a deep layer Casuarina needles and no artefacts were identified (Plate 4.9).

Overall, the field investigation indicated that the study area has a range of moderate and heavy ground disturbance as a result of modern activities in most locations. This is especially the case in the southern half of the study area, where quarrying, and related activities such as stockpiles and noise bunds, have altered the landscape significantly.

The only area of moderate archaeological potential includes a corridor, approximately 50 m wide along the section of Oaky Creek to the south of the dams. Oaky Creek runs south to north along the eastern boundary of the study area but is outside the proposed disturbance footprint of the project (Figure 1.2).

An overview of the site assessment is shown in Figure 4.1. Photographs corresponding to points on the figure are included in Appendix B.

Plate 4.1 **Location of proposed weighbridge and office in north-east corner of the site. Dense pasture grasses and low surface visibility. View north.**

Plate 4.2 **Tree with scar to the west of stockpile area. Existing stockpile/bund in background. View north east.**

Plate 4.3 **Woodland area of young trees affected by dieback, western study area. Tree with scar is in the background. View south.**

Plate 4.4 **Bund and stockpiles. Photograph taken from south west corner of the site. View north.**

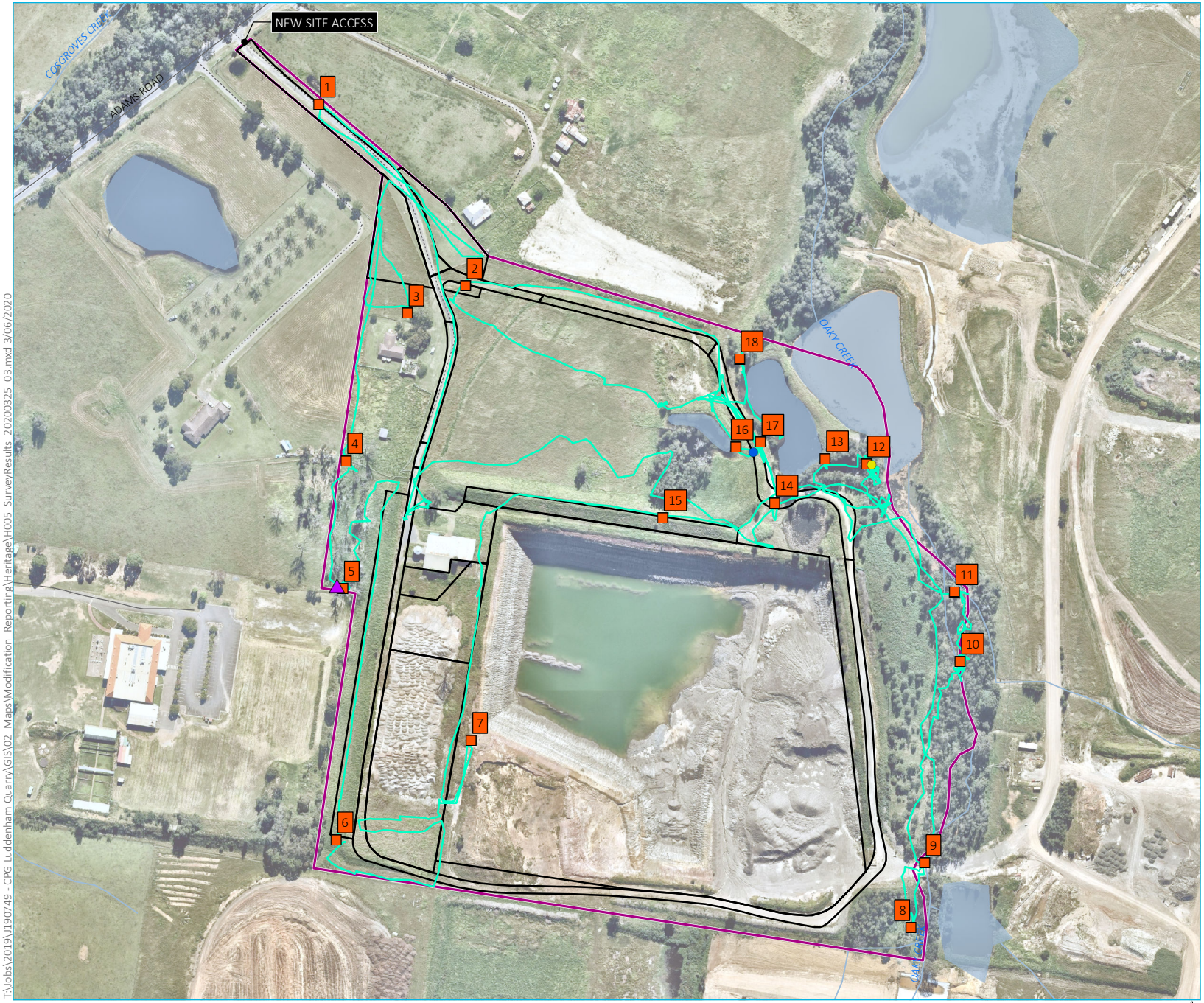
Plate 4.5 **Elevated terrace flat beside Oaky Creek. Potential for Aboriginal objects in this woodland area on the west side of Oaky Creek. Negligible surface exposure. View south.**

Plate 4.6 **Fill used to create a level surface for the road. Bund beside dam behind. View north west.**

Plate 4.7 **Incorrect location of AHIMS site #45-5-2280 as recorded on the AHIMS database. View north.**

Plate 4.8 **Fenced area around AHIMS site #45-5-2280. View north.**

Plate 4.9 **AHIMS site #45-5-2280. Eroded bank within the enclosure where artefacts were identified. Area is now covered in a deep layer of Casuarina needles View north.**



KEY

- Study area
- Proposed quarry layout
- Waterbody
- Minor road
- Vehicular track
- Watercourse
- Heritage survey track
- Photo location
- Tree with scar

AHIMS site ID 45-5-2280

- Incorrect location
- Correct location

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Source: EMM (2020); DFSI (2017); Nearmap (2020)

0 50 100 m

GDA 1994 MGA Zone 56

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Site Inspection results

Luddenham Quarry - Modification 5
Aboriginal Heritage Due Dilligence
Figure 4.1

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5 Conclusions and recommendations

5.1 Assessment of archaeological potential

The desktop and field survey investigations for this due diligence assessment demonstrate that the study area is comparable with the wider cultural landscape of the Cumberland Plain. As outlined in Section 3, the Cumberland Plain is one of the most intensely archaeologically studied regions in Australia, and as such we have a good understanding of past Aboriginal activity. Specifically, while there is evidence of people in the Sydney Basin by at least 36 ka, much of the Cumberland Plain appears to have become established only in the late Holocene (5–0 ka). This was likely in response to increasing population pressures and improving climatic conditions driving more permanent occupation of this region, and away from the major river systems, such as the Hawkesbury-Nepean River.

Archaeological evidence suggests that people utilised a wide range of resources across the region, and especially the silcrete raw materials from the Blacktown, Riverstone and Plumpton Ridge areas. These materials were moved along the major river systems across much of the Sydney Basin. Foci of occupation also appears to be primarily associated with the major river systems, although a transient use of all environments was known to occur. While a range of archaeological sites types are found across the Cumberland Plain reflecting these activities, much of the landscape constrains cultural material to stone artefacts located on the surface and/or in the upper soil profile.

In summary, the following conclusions can be made:

- there is one registered AHIMS site within the study area; however, the site inspection confirmed that the coordinates do not correspond with the location of the fenced area where the site is physically located which is outside of proposed activity areas;
- the existing environmental context and a review of archaeological information indicates that it is possible for archaeological deposits to occur within the riparian corridor of Oaky Creek;
- a site inspection identified that the riparian corridor of Oaky Creek is the area most likely to have potential archaeological deposit although no Aboriginal cultural material was located during the site inspection; and
- there is negligible potential for surface and/or subsurface material to be present in the southern half of the study area where the landscape has been modified by quarrying and other earthworks.

5.2 Potential impacts

The study area has already been subject to a high level of disturbance and it is unlikely for Aboriginal objects to occur within the study area apart from the area beside Oaky Creek. The AHIMS site within the study area (#45-5-2280) is outside the area likely to be impacted by the proposed modification and is currently protected by fencing.

The tree with a scar that was identified during the site inspection is deemed not to have been culturally modified. It is situated near the western boundary of the study area, outside the proposed activity to the west of an existing noise bund (Figure 1.2) and will not be impacted by the proposed modification.

Specifically, the proposed activities for Modification 5 are unlikely to harm Aboriginal objects. Apart from the internal road which will follow an existing road alignment, all proposed new activities will be at least 200 m from Oaky Creek and no less than 200 m from Cosgroves Creek (outside the study area to the west of Adams Road).

The proposed location for a new office and weighbridge in the north-west corner of the study area is situated in an area that has been disturbed by previous clearance and farming activities. Although it is possible for artefacts to

occur anywhere in the landscape, they are likely to be rare on this floodplain landform that is more than 200 m from water.

The proposed extended stockpiling area to the immediate north of the existing stockpile area, and the proposed adjacent equipment laydown area are within areas already disturbed by quarrying and/or farming activities. The internal road will follow the existing road alignment that has been created with introduced fill and levelling.

5.3 Recommendations

In accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW 2010), a due diligence assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010) has been completed as a first step to identify whether Aboriginal objects or places are likely to be harmed by the project. Based on the current available project design and disturbance footprint, this assessment concludes that Aboriginal objects are unlikely to be harmed by the project and further investigation beyond the scope of a due diligence assessment is not warranted for the project.

Further investigation in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) is unlikely to build upon the findings of this assessment, unless test excavation is explored. However, the project impact footprint would not meet the pre-conditions warranting test excavation because a potential archaeological deposit (PAD) has not been identified in the current or previous investigations of the study area. As such, further investigation is not considered to be warranted as Aboriginal objects are unlikely to be harmed by the proposed modification.

The following recommendations are based on the proposed activity in its current design:

1. AHIMS site #45-5-2280 continues to be avoided and protected by fencing.

2. The corrected coordinates for AHIMS site #45-5-2280 are entered in the AHIMS database.

3. The riparian corridor along the western bank of Oaky Creek continues to be avoided by quarrying activities.

4. Work may proceed with caution, following the recommendation below:

    a) In the event that unexpected Aboriginal objects, sites or places are discovered in the study area, it is a requirement that DPIE is notified of the existence of Aboriginal objects as soon as practicable after they are first identified. This is done through the completion of an DPIE Aboriginal Site Card which is submitted to the Registrar of AHIMS for inclusion on the Aboriginal site database. Under s85A of the NPW Act, Aboriginal objects remain the property, and under the protection of, the Crown until formal transfer to a person or persons of a class prescribed by the regulations occurs.

    b) In the event that known or suspected human skeletal remains are encountered within the study area, the following procedure should be followed:

    - the immediate vicinity will be secured to protect the find and the find will be immediately reported to the work supervisor who will immediately advise the site supervisor or other nominated senior staff member;

    - the environmental manager or other nominated senior staff member will notify the police and the state coroner on the same day of the find (as required for all human remains discoveries);

    - the environmental manager or other nominated senior staff member will contact DPIE for advice on identification of the skeletal material as Aboriginal and if so, management of the material;

- if it is determined that the skeletal material is ancestral Aboriginal remains, the Aboriginal community will be contacted, and consultative arrangements will be made to discuss ongoing care of the remains;
- the site will be recorded in accordance with the NPW Act and DPIE guidelines; and
- if the remains are historical and not of Aboriginal origin, the Heritage Division of DPIE will be notified for further instruction.

5.4 Conclusion

In accordance with Step 4 of the due diligence guidelines (DECCW 2010), this assessment concludes that no further Aboriginal heritage investigations are required for the proposed activity.

Table 5.1 describes the basic steps of a due diligence assessment as set out in Section 8 of the due diligence guidelines (refer Figure 1.2). It provides an overview of the assessment results in accordance with these steps and lists the section(s) in the report where each of these is addressed in full.

Table 5.1 Due diligence summary

Step	Results	Section in report
STEP 1: Check for records of Aboriginal objects and places in area of proposed activity.	An AHIMS search was conducted on 20 January 2020. There is one previously recorded site (45-5-2280) within the study area.	Section 3.5 Figure 3.1
STEP 2: Is the activity a 'Low Impact Activity', as defined in the National Parks and Wildlife Regulation?	The proposed activity is not considered to be a 'Low Impact Activity' as defined by the guidelines, since it will involve earthworks and ground disturbance.	Section 1.4
STEP 3: Are there any landscape features on undisturbed land that are likely to indicate the presence of Aboriginal objects?	The landscape feature likely to indicate the presence of Aboriginal objects is the elevated, level area to the west of Oaky Creek, within 100 m of the creek. However, the areas where ground disturbance is proposed are unlikely to contain Aboriginal objects due to the high level of previous subsurface disturbance. The disturbance footprint is over 200 m from Oaky Creek and from Cosgroves Creek.	Section 2 and 4
STEP 4: Does a desktop assessment and visual inspection confirm that there are Aboriginal objects present or likely to be present?	One site #45-5-2280 is located within the study area. The spatial coordinates recorded on AHIMS for this site are incorrect. The site location was ground truthed during the site inspection and confirmed to be outside the proposed disturbance footprint. Visual inspection indicated that there is moderate potential for other Aboriginal objects to be present within the riparian corridor beside Oaky Creek.	Sections 3; 4
STEP 5: Can the activity be relocated away from the known/likely area for Aboriginal objects?	The proposed activities are not in areas where known Aboriginal sites occur or in areas where Aboriginal objects are likely to occur. #45-5-2280 is already fenced and will be avoided by the proposed activities.	Section 5.2

References

Attenbrow 2004, *What's Changing: Population size or Land-use patterns? The Archaeology of Upper Mangrove Creek, Sydney Basin*. Terra Australis 21. The Australian National University, Canberra, ACT.

Australian Museum Business Services (AMBS) 2006, Aboriginal Heritage Management Plan: West Dapto Release Area. Unpublished report for Wollongong City Council.

Bannerman, SM & Hazelton, PA 1990, *Soil Landscapes of the Penrith 1:100 000 Sheet*, Soil Conservation Service of NSW, Sydney NSW.

Biosis 2019, *Mamre South Precinct State Significant Development: Aboriginal cultural heritage assessment,* report prepared for Altis Property Partners and Frasers Property Industrial Constructions.

Bowdler, S. 1970, *Bass Point: The Excavation of a South-East Australian Shell Midden Showing Cultural and Economic Change*. Honours thesis, University of Sydney, Sydney.

Bowler, J.M. et al. 2003, New ages for human occupation and climatic change at Lake Mungo, Australia. *Nature* 441:837-840.

Bradshaw, C.J.A., Ulm, S., Williams, A.N., Bird, M.I., Roberts, R.G., Jacobs, Z., Laviano, F., Weyrich, L., Friedrich, T., Norman, K., Saltre, F. 2019, Minimum founding populations of the first people to colonise Australia. *Nature Ecology and Evolution.*

Brayshaw McDonald Pty Ltd 1993, Archaeological investigations for the RHIP (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill and Parklea. Final report on test excavation programme. Report authored by J. McDonald. and E. Rich. Report to RH (Stage 1) Pty Ltd. NSW NPWS: Sydney (unpublished report).

Collins 1798, An Account of the English Colony in New South Wales Vol 1. London: T. Cadell Jun. and W. Davies, 1798.

Department of Conservation, Climate Change and Water (DECCW)

- 2008 Soil and Land Resources of the Hawkesbury-Nepean Catchment.
- 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW.

Dortch, C. 1979, Devil's Lair, an example of prolonged cave use in southwestern Australia. *World Archaeology* 10:258–279.

Douglas Nicolaisen and Associates 2003, *Environmental Impact Statement: Proposed Clay/Shale Extraction Operation, Lot 3, 275 Adams Road, Luddenham NSW*, report for Badger Mining Company Pty Ltd.

Epic Mining 2016, *Environmental Assessment Report: Luddenham Clay and Shale Quarry* (Modification 4).

Gould 1977, *Puntutjarpa rockshelter and the Australian desert culture.* Anthropological papers of the American museum of natural history: New York.

Haglund, L. 1980, *Report on Archaeological survey in the Blacktown area*. Unpublished report.

Hamm, G., Mitchell, P., Arnold, L.J., Prideaux, G.J., Questiaux, D., Spooner, N.A., Levchenko, V.A., Foley, E.C., Worthy, T.H., Stephenson, B., Coulthard, V., Coulthard, C., Wilton, S., Johnston, D. 2016, Cultural innovation and megafauna interaction in the early settlement of arid Australia. *Nature* 539: 280–283.

Hughes, P., Lampert, R. 1982, Prehistoric population changes in southern coastal New South Wales in s. Bowdler (ed) *Coastal Archaeology in Eastern Australia: Proceedings of the 1980 Valla Conference on Australian Prehistory,* pp.16-28.

Jo McDonald Cultural Heritage Management Pty Ltd JMCHM)

- 2005 Archaeological salvage excavation of eight archaeological landscapes in the Second Ponds Creek Valley, Rouse Hill Development Area, NSW, report to RHI and Landcom.

- 1997 Interim heritage management report: ADI Site, St Marys. Volume 1: Text. Report to Lend Lease – ADI Join Venture in response to the Section 22 Committee Interim Report report to NSW NPWS: Sydney.

- 1999, Survey for archaeological sites, proposed Rouse Hill Stage 2 infrastructure works at Rouse Hill, Parklea and Kellyville, NSW (Mark II), report prepared for GHD on behalf of RHIC. NSW National Parks and Wildlife Service.

Kohen, J. L. 1986, *Prehistoric settlement in the western Cumberland Plain: resources, environment and technology*. Unpublished PhD Thesis, School of Earth Sciences, Macquarie University, Sydney.

Lampert, R.J 1971, *Burrill Lake and Currarong: Coastal Sites in Southern New South Wales.* Terra Australia I Department of Prehistory, Research School of Pacific Studies, ANU.

Langley M, Clarkson C, Ulm S 2011, From small holes to grand narratives: the impact of taphonomy and sample size on the modernity debate in Australia and New Guinea. *Journal of Human Evolution* 61:197-208.

Long, A. 2003, *Scarred Trees: An Identification and Recording Manual,* prepared for Aboriginal Affairs Victoria.

Navin Officer Heritage Consultants

- 1997 Aboriginal Cultural Heritage, Technical Paper 11, Proposal for a Second Sydney Airport at Badgerys Creek or Holsworthy Military Area, report to PPK Environment and Infrastructure for the Commonwealth Department of Transport and Regional Development.

- 2016 Western Sydney Airport: Aboriginal Cultural Heritage Assessment, report to GHD.

O'Connell, J.F., Allen, J., Williams, M.A.J., Cooper, A., Williams, A.N., Turney, C.S.M., Spooner, N.A., Kamminga, J., Brown, G. 2018, When did Homo Sapiens firs reach Southeast Asia and Sahul? *Proceedings of the National Academy of Sciences of the United States (Perspectives)*, www.pnas.org/cgi/doi/10.1073/pnas.1808385115.

Pam Dean-Jones Archaeological Services (Dean-Jones) 1991, *Proposed Clay/Shale Extraction, Lot 3 DP623799, Adams Road Luddenham: Archaeological Survey,* report for R.A. Cole Town Planning Pty Ltd.

Pardoe, C. 1993, Wamba Yadu, a Later Holocene Cemetery of the Central River Murray. *Archaeology in Oceania, 28*(2), 77-84.

Pate, F.D., Pretty, G.L., Hunter, R., Tuniz, C., Lawson, E.M. 1998, New radiocarbon dates for the Roonka Flat Aboriginal burial ground, South Australia. *Australian Archaeology*, 46: 36-37.

Tobler, R., Rohrlach, A., Soubrier, J., Bover, P., Llamas, B Tuke, J., Bean, N., Abdullah-Highfold, A., Agius, S., O'Donoghue, A., O'Loughlin, I., Sutton, P., Zilio, F., Walshe, K., Williams, A.N., Turney, C.S.M., Williams, M., Richards, S.M., Mitchell, R.J., Kowal, E., Stephen, J.R., Williams, L., Haak, W., Cooper, A. 2017, Aboriginal mitogenomes reveal 50,000 years of regionalism in Australia. *Nature,* 544*:* 180–184.

Turney C.S.M. et al. 2001, Early human occupation at Devil's Lair, southwestern Australia 50,000 years ago. Quaternary Research, 55:3-13.

Veth, P.M. 1993, *Islands in the Interior: The Dynamics of Prehistoric Adaptations Within the Arid Zone of Australia* (International Monographs in Prehistory).

Williams, A.N. 2013, A new population curve for prehistoric Australia. *Proceedings of the Royal Society B,* 280: 20130486*.*

Williams, A.N., Burrow, A., Toms, P., Brown, O., Richards, M., Bryant, T. 2017, The Cranebrook Terrace Revisited: Recent Excavations of an Early Holocene Alluvial Deposit on the banks of the Nepean River, NSW, and their Implications for Future Work in the Region. *Australian Archaeology,* 87(3), 100-109.

Williams, A.N., Mitchell, P., Wright, R.V.S., Toms, P. 2012, A Terminal Pleistocene Open Site on the Hawkesbury River, Pitt Town, NSW. *Australian Archaeology,* 74: 85-97.

Williams, A.N., Ulm, S., Cook, A.R., Langley, M., Collard, M. 2013, Human refugia in Australia during the Last Glacial Maximum and Terminal Pleistocene: A geo-spatial analysis of the 25-12ka Australian archaeological record. *Journal of Archaeological Science,* 40: 4612-4625.

Williams, A.N., Ulm, S., Turney, C.S.M., Rodhe, D., White, G. 2015b, The Establishment of Complex Society in Prehistoric Australia: Demographic and Mobility Changes in the Late Holocene. *Plos One,* 10(6): e0128661.

Williams, A.N., Veth, P.M., Steffen, W., Ulm, S., Turney, C.S.M., Reeves, J. Phipps, S, Smith, M. 2015a, A Continental Narrative: Human Settlement Patterns and Australian Climate Change over the last 35,000 Years. *Quaternary Science Reviews* 123, 91-112.

Appendix A

AHIMS

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Luddenham ADD MOD

Client Service ID : 478315

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2788	B 112	AGD	56	291490	6248790	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2789	B 94	AGD	56	289140	6249400	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2562	EG6	AGD	56	288745	6248166	Open site	Valid	Artefact : 6	Open Camp Site	
	Contact	**Recorders**	Annie Nicholson					**Permits**		
45-5-2781	B86	AGD	56	290820	6248920	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2782	B84	AGD	56	289980	6248560	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2710	DUKE 9	AGD	56	292500	6251800	Open site	Valid	Artefact : -		1345,1539,4737
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2711	CDG1	AGD	56	293300	6252800	Open site	Valid	Artefact : -		1345,1539,4737
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2816	IF/1	AGD	56	292300	6251750	Open site	Valid	Artefact : -		4737
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2632	B 44	AGD	56	290900	6248950	Open site	Valid	Artefact : -		
	Contact Gandangara LALC	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2783	B43	AGD	56	289150	6248700	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-5240	Elizabeth Drive AFT 2	GDA	56	292088	6249612	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-5-2762	B95	AGD	56	289290	6249700	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2763	B87	AGD	56	291080	6249400	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2764	B82	AGD	56	289100	6249470	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2765	B83	AGD	56	289050	6249590	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-2768	B41	AGD	56	292100	6249010	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-4708	SSP 2	GDA	56	288626	6252917	Open site	Valid	Artefact : -		

Report generated by AHIMS Web Service on 20/01/2020 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 284000 - 294000, Northings : 6248000 - 6253000 with a Buffer of 0 meters. Additional Info : Due Dil Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Matthew Kelleher,Kelleher Nightingale Consulting Pty Ltd,Ms.Cristany Milicich					**Permits**		
45-5-4688	B137	GDA	56	288290	6248680	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes					**Permits**		
45-5-4689	B138	GDA	56	289169	6248810	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes					**Permits**		
45-5-4690	B139	GDA	56	289336	6248914	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes					**Permits**		
45-5-4691	B140	GDA	56	289400	6248982	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes					**Permits**		
45-5-4692	B141	GDA	56	289232	6248893	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes					**Permits**		
45-5-5259	Elizabeth Drive AFT 1	GDA	56	293377	6249426	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-5-5230	Elizabeth Precinct Isolated Find 03 (EPIF 03)	GDA	56	293375	6249980	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5231	Elizabeth Precinct Isolated Find 02 (EPIF 02)	GDA	56	293466	6250004	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5232	Elizabeth Precinct Isolated Find 01 (EPIF 01)	GDA	56	293416	6249892	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5233	Elizabeth Precinct Artefact Scatter 01 (EPAS 01)	GDA	56	293412	6249873	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5234	Elizabeth Precinct PAD 03	GDA	56	293924	6249724	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5235	Elizabeth Precinct PAD 02	GDA	56	293327	6249529	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-5236	Elizabeth Precinct PAD 01	GDA	56	293094	6249617	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-2550	CGD1	AGD	56	293350	6252800	Open site	Valid	Artefact : -	Open Camp Site	98435
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2551	CGD6	AGD	56	292700	6251900	Open site	Valid	Artefact : -	Open Camp Site	

Report generated by AHIMS Web Service on 20/01/2020 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 284000 - 294000, Northings : 6248000 - 6253000 with a Buffer of 0 meters. Additional Info : Due Dil Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2552	CGD3	AGD	56	293000	6252800	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	98435
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2553	CGD4	AGD	56	293300	6252500	Open site	Valid	Artefact : -, Modified Tree (Carved or Scarred) : -	Open Camp Site,Scarred Tree	98435
	Contact	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**		
45-5-2504	RC 8 - "Roscrea 8"	AGD	56	284100	6251880	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Stephanie Garling					**Permits**		
45-5-2505	RC 7 - "Roscrea 7"	AGD	56	284230	6250620	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2506	RC 6 - "Roscrea 6"	AGD	56	284130	6250740	Open site	Valid	Artefact : -	Isolated Find	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2508	RC 4 - "Roscrea 4"	AGD	56	284030	6250980	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2509	RC 3 - "Roscrea 3"	AGD	56	284250	6251190	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2510	RC 2 - "Roscrea 2"	AGD	56	284340	6252070	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2511	RC 1 - "Roscrea 1"	AGD	56	284290	6252080	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Doctor.Jo McDonald,Stephanie Garling					**Permits**		
45-5-2309	BC/ED1	AGD	56	292260	6249550	Open site	Valid	Artefact : -	Open Camp Site	3346
	Contact	**Recorders**	Helen Brayshaw					**Permits**		
45-5-2280	Oaky Creek 1	AGD	56	289000	6249350	Open site	Valid	Artefact : -	Open Camp Site	2378
	Contact	**Recorders**	Pam Dean-Jones,P Jones					**Permits**		
45-6-1775	Lec 9;	AGD	56	293200	6252700	Open site	Valid	Artefact : -	Open Camp Site	1345,98435
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-5-0215	South Creek	AGD	56	293800	6249900	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	362
	Contact	**Recorders**	Ms.Laila Haglund					**Permits**		
45-5-0496	Fleurs1 Fleurs Radio Telescope	AGD	56	293750	6250730	Open site	Valid	Artefact : -	Open Camp Site	961,1018,98435
	Contact	**Recorders**	University of Sydney					**Permits**		
45-5-0528	Fleurs 2 (Fleurs Prospect)	AGD	56	292650	6251150	Open site	Valid	Artefact : -	Open Camp Site	1018

Report generated by AHIMS Web Service on 20/01/2020 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 284000 - 294000, Northings : 6248000 - 6253000 with a Buffer of 0 meters. Additional Info : Due Dil Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Richard Wright					**Permits**		
45-5-2991	TCE 1	AGD	56	293300	6252700	Open site	Valid	Artefact : -		99352
	Contact T Russell	**Recorders**	Dominic Steele Archaeological Consulting					**Permits**	2056	
45-5-5066	B129	GDA	56	289263	6249105	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					**Permits**		
45-5-5068	B131	GDA	56	291374	6249478	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					**Permits**		
45-5-5071	B134	GDA	56	288311	6248711	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					**Permits**		
45-5-5086	B164	GDA	56	291416	6249269	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5087	B165	GDA	56	291638	6249555	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5088	B166	GDA	56	291597	6249204	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5089	B163	GDA	56	291331	6249177	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5091	B145	GDA	56	287546	6248235	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5094	B154	GDA	56	291387	6249360	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5095	B153	GDA	56	292169	6249253	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5096	B152	GDA	56	292043	6249416	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5097	B151	GDA	56	291950	6249517	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5099	B146	GDA	56	291304	6248825	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5100	B147	GDA	56	291272	6248841	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5101	B149	GDA	56	291781	6249036	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					**Permits**		
45-5-5079	B155	GDA	56	292110	6248827	Open site	Valid	Artefact : -		

Report generated by AHIMS Web Service on 20/01/2020 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 284000 - 294000, Northings : 6248000 - 6253000 with a Buffer of 0 meters. Additional Info : Due Dil Assessment. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5080	B156	GDA	56	291953	6248581	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5081	B157	GDA	56	292146	6248243	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5085	B162	GDA	56	291157	6248456	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5102	B148	GDA	56	291448	6248568	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5103	B150	GDA	56	291780	6249055	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5105	PAD 1	GDA	56	288830	6250071	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-4941	LU-IA-17	GDA	56	288175	6248750	Open site	Valid	Artefact : -		
	Contact	Recorders	AECOM Australia Pty Ltd - Sydney,Mr.Luke Wolfe					Permits		
45-5-5022	B113	GDA	56	291594	6248980	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					Permits		
45-5-5172	B170	GDA	56	292275	6249513	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5173	B169	GDA	56	291139	6249197	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5174	B168	GDA	56	290418	6249371	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5175	B167	GDA	56	291064	6248281	Open site	Valid	Artefact : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi					Permits		
45-5-5058	B121	GDA	56	292147	6248734	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					Permits		
45-5-5059	B122	GDA	56	288102	6248382	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					Permits		
45-5-5064	B127	GDA	56	288754	6248012	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					Permits		
45-5-5065	B128	GDA	56	289363	6248993	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Jo Dibden					Permits		

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2507	RC 5 - "Roscrea 5"	AGD	56	284180	6250790	Open site	Valid	Artefact : -	Isolated Find	
Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling						Permits		
45-5-2664	B89	AGD	56	288300	6248680	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2665	B88	AGD	56	291220	6249120	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2667	B90	AGD	56	291800	6248760	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2668	B93	AGD	56	289150	6248250	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2678	B80	AGD	56	289100	6248650	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2679	B81	AGD	56	289000	6248800	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-2705	B15	AGD	56	291000	6248120	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-3802	Isolated Artefact 1 (Penrith)	GDA	56	287238	6252000	Open site	Valid	Artefact : 1		
Contact	Recorders	Ms.Mary Dallas						Permits		
45-5-3803	Isolated Artefact 2 (Penrith)	AGD	56	287504	6252095	Open site	Valid	Artefact : 1		
Contact	Recorders	Ms.Mary Dallas						Permits		
45-5-3804	Isolated Artefact 4 (Penrith)	AGD	56	287276	6251479	Open site	Valid	Artefact : 1		
Contact	Recorders	Ms.Mary Dallas						Permits		
45-5-3805	OS 1	AGD	56	287973	6252553	Open site	Valid	Artefact : 3		
Contact	Recorders	Ms.Mary Dallas						Permits		
45-5-3806	OS 2	AGD	56	286575	6252169	Open site	Valid	Artefact : 2		
Contact	Recorders	Ms.Mary Dallas						Permits		
45-5-3808	OS 3	AGD	56	287435	6252155	Open site	Valid	Artefact : 4		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd						Permits		
45-5-4779	TNR AFT 13	GDA	56	286413	6252059	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4783	TNR AFT 18	GDA	56	286462	6249630	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4786	TNR AFT 14	GDA	56	286758	6251468	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Luddenham ADD MOD

Client Service ID : 478315

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4787	TNR AFT 17	GDA	56	287144	6249775	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4788	TNR AFT 15	GDA	56	286985	6250420	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4790	TNR AFT 19	GDA	56	287276	6249519	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4792	TNR AFT 20	GDA	56	287212	6248889	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4793	TNR AFT 22	GDA	56	287032	6248550	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Kelleher Nightingale Consulting Pty Ltd,Mr						Permits		
45-5-4794	TNR AFT 23	GDA	56	286651	6248317	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4796	TNR AFT 16	GDA	56	287012	6250214	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4808	TNR IF 04	GDA	56	287033	6250644	Open site	Valid	Artefact : -		
Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson						Permits		
45-5-4936	M12-AS-02	GDA	56	289990	6251404	Open site	Valid	Artefact : -		
Contact	Recorders	Mr.Neville Baker,Sydney Water-Parramatta						Permits		
45-5-4748	M12 A2	GDA	56	292624	6251214	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes						Permits		
45-5-4749	M12 A4	GDA	56	293785	6251051	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes						Permits		
45-5-4750	M12 A3	GDA	56	292725	6251214	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes						Permits		
45-5-4747	M12 A1	GDA	56	292194	6251184	Open site	Valid	Artefact : -		
Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Mrs.Nicola Hayes						Permits		

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Appendix B

Photographs from site assessment

Photographs from site inspection

Photo ID	Description	Photo direction
01.1	Entry to property	East
02.1	Track exposure on cleared area with pasture grasses	East
03.1	High grass coverage. Low exposure	North
04.1	Trees. Bund of quarry to the left	South
05.1	Scar on tree	North
05.2	Scar on tree	North
05.3	Canopy of tree with scar	North
06.1	Stockpiles	North
06.2	Stockpiles	North-east
06.3	South east corner of the site, from the bund.	South
07.1	Quarry	North-east
07.2	Quarry	North-east
08.1	Vegetated area. Brambles, tall grass(exotic) and natives	West
09.1	Vegetated area. Young eucalypts	North-west
09.2	Oaky Creek, from the bridge	North
09.3	Oaky Creek, from the bridge	South
09.4	Oaky Creek, from the bridge	South
10.1	Oaky Creek, dry	South
10.2	Oaky Creek, flood area to the west	South-west
10.3	Road, built up with introduced material	North-west
11.1	Possible PAD. Elevated area beside drainage line.	South
11.2	Possible PAD. Elevated area beside drainage line.	South-east
12.1	Fenced area location of #45-5-2280.	South
12.2	Fenced area location of #45-5-2280, dam to the east	North
12.3	Inside the fenced area, no surface exposure, eroded bank.	North
12.4	Vegetation surrounding fenced area	North
13.1	Dry creek bed lined with casuarinas.	East
13.2	Dry creek bed lined with casuarinas.	South-east
13.3	Raised area at north end to create dam on other side	North
14.1	Wetland	South-east
15.1	Casuarina woodland, north of quarry	North
15.2	Quarry	South
16.1	Dam near recorded locale of #45-5-2280;	North-west

Photographs from site inspection

Photo ID	Description	Photo direction
16.2	Grove of trees south of dam	West
17.1	Locale of #45-5-2280. No fences or pegs or surface visibility	North-west
17.2	Locale of #45-5-2280. No fences or pegs or surface visibility	South-east
17.3	Locale of #45-5-2280. No fences or pegs or surface visibility	North-west
18.1	Dam. North east corner of site.	South
18.2	Dam. North east corner of site.	West
18.3	Gravels and introduced rocks. Southern end of dam	South

Photograph 1.1

Photograph 2.1

Photograph 3.1

Photograph 4.1

Photograph 5.1

Photograph 5.2

Photograph 5.3

Photograph 6.1

Photograph 6.2

Photograph 6.3

Photograph 7.1

Photograph 7.2

Photograph 8.1

Photograph 9.1

Photograph 9.2

Photograph 9.3

Photograph 9.4

Photograph 10.1

Photograph 10.2

Photograph 10.3

Photograph 11.1

Photograph 11.2

Photograph 12.1

Photograph 12.2

Photograph 12.3

Photograph 12.4

Photograph 13.1

Photograph 13.2

Photograph 13.3

Photograph 14.1

Photograph 15.1

Photograph 15.2

Photograph 16.1

Photograph 16.2

Photograph 17.1

Photograph 17.2

Photograph 17.3

Photograph 18.1

Photograph 18.2

Photograph 18.3


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