Prepared for
DesignInc Sydney
ABN: 87 003 008 820

BAE F-53 AV MRO&U Facilities

Aboriginal and Historic Heritage Due Diligence Assessment

31-Aug-2022

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ABN: 87 003 008 820

Prepared by

AECOM Australia Pty Ltd
Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8008 1700 www.aecom.com
ABN 20 093 846 925

In association with

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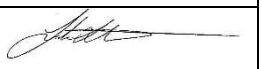
2	27-Nov-2020	Draft report	Luke Wolfe/Senior Archaeologist	
3	25-Aug-2022	Updated draft and final	Geordie Oakes/Principal Heritage Specialist	

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by DesignInc, on behalf of BAE Systems Australia (BAE) to prepare a preliminary combined Aboriginal Archaeological Due Diligence and Historical Heritage Assessment for the proposed facilities upgrades at the BAE Williamtown site, located 20 kilometres north-east of Newcastle, NSW.

BAE proposes to upgrade and expand its Air Vehicle Maintenance, Repair, Overhaul and Upgrade (AV MRO&U) facilities to support the introduction of Australian F-53 Air Vehicles on the BAE Williamtown site between 2020 and 2030. AECOM understands this will comprise of two schedules of work, consisting of the South Hangar Adaptive Reuse and the North Hangar Adaptive Reuse and Extension.

The study area comprises an irregular shaped parcel of land, approximately 9.7 hectare (ha) in size, located on Commonwealth land that is predominately owned and controlled by the Department of Defence. The study area falls within parcels of land leased and managed by Newcastle Airport Pty Ltd (NAPL), land sublet to BAE, and private land undergoing purchase by NAPL.

A search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on 25 August 2022 for a 3 x 3 km area centred on the Study area. A total of nine (9) registered sites comprising eight open artefact sites, one with an associated area of Potential Archaeological Deposit (PAD), and one burial were identified. No AHIMS sites are registered within the Study area and no sites are registered within 100 metres of the Study area.

Searches of relevant heritage registers and lists were undertaken on 16 November 2020 to identify previously recorded historical heritage items within and in proximity to the Study area. No heritage listed items were identified within the Study area.

While not located within the heritage listed curtilage of the RAAF Base Williamtown, a portion of the Study area lies partly within the curtilage of the RAAF Base Williamtown, managed under the current HMP. Indigenous cultural heritage and Historical Heritage values and sites have been identified and assessed within the HMP. Indigenous cultural heritage values have been identified within Zone 2 – Williamtown Cultural Landscape and Zone 3 – Runway. Historical heritage values have been identified within Zone 1 –Base Core, and Zone 3 – Runway. The portion of the Study area located within land covered under the 2008 HMP is designated as Zone 4 – RAAF Base Williamtown Free Area. No Indigenous cultural heritage or historical heritage values have been identified within this area.

A visual inspection of the Study area was undertaken by AECOM Archaeologist Julia Atkinson on 23 November 2020. All outside areas across the Study area were traversed where access was not restricted by security fences. Due to Defence regulations, photography was not permitted during the inspection. No Aboriginal or Historical Heritage sites were identified during visual inspection.

This assessment has determined that there are no identified Aboriginal or historical heritage constraints applicable to the Project that are located within the Study area. There are no registered Aboriginal or historical sites or relics located within the Study area and both the landform and high levels of previous disturbance documented and observed across the Study area render the potential for unknown and/or subsurface artefacts unlikely.

On the basis of the assessment undertaken, the following recommendations are made:

1. The Study area has been assessed as being located in an area of low Aboriginal archaeological sensitivity, due both to the low-lying landform itself and high levels of past disturbance. No Aboriginal archaeological constraints are associated with the Study area;
2. In the unlikely event that Aboriginal objects or historical relics, including possible human skeletal remains, are identified during the proposed works, all works in the area must cease immediately and the procedures outlined in Appendix C of this report should be followed as applicable to the area of discovery[1]. The stop works procedure should be included within the Project's construction management plan

[1] AECOM acknowledges that part of the Study area falls under the management schedules of the RAAF Base Williamtown HMP, which contain mitigation measures for 'unforeseen discoveries' outlined in Section 3.3.7 of the HMP. However, AECOM recommends that standard State-based procedures for managing unexpected Aboriginal and historical heritage discoveries be implemented as best practice.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by DesignInc, on behalf of BAE Systems Australia (BAE), to undertake a preliminary combined Aboriginal Archaeological Due Diligence and Historical Heritage Assessment for proposed facility improvements at the BAE Williamtown site, located immediately south west of Newcastle Airport and Royal Australian Air Force (RAAF) Base Williamtown (the Base), in New South Wales (NSW) (hereafter, 'the Study area') (Figure 1).

This report documents the results of AECOM's assessment and has been compiled with reference to the NSW Department of Premier and Cabinet (DPC) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment Climate Change & Water, 2010a) and *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (NSW Department of Environment Climate Change & Water, 2010b), as well as reference to the document *Assessing Heritage Significance* (Department of Environment and Heritage Protection, 2013). These codes have been developed to assist proponents in exercising due diligence when carrying out activities that may harm Aboriginal objects and historic relics, respectively.

AECOM Archaeologist Julia Atkinson was the primary author of the report and undertook visual inspection of the Study area. AECOM Senior Archaeologist Luke Wolfe provided technical review for the report.

1.1 The Project

BAE is seeking to upgrade and expand its Air Vehicle Maintenance, Repair, Overhaul and Upgrade (AV MRO&U) facilities to support the introduction of Australian F-53 Air Vehicles on the BAE Williamtown site between 2020 and 2030.

The Project comprises two schedules of work:

- Schedule 1 – South Hangar Adaptive Reuse: Four new F-35 General Maintenance Bays to be located in the existing hangar, hangar floor fit-out, supporting facilities and site services amplification.
- Schedule 2 – North Hangar Adaptive Reuse and Extension: Extension of the existing facility to provide seven F-35 General Maintenance Bays. This work element includes Enabling Works to be delivered on the adjacent Newcastle Airport Astra Aerolab subdivision.

1.2 Study Area

The Study area for this assessment, shown on Figure 1, comprises an approximate 9.7 hectare (ha) irregular portion of land, located in the Hunter Region, roughly 20 kilometres (km) north-east of Newcastle, NSW. The Study area is located within the Port Stephens Local Government Area (LGA) on predominately Commonwealth land and is largely owned and controlled by the Department of Defence. Land within the Study area is leased and managed by Newcastle Airport Pty Ltd (NAPL); however, a portion of the Study area is sublet to BAE as part of a long-term lease agreement. The remaining section of the Study area is private land undergoing purchase from NAPL. Site designations are shown in Figure 2.

The BAE site adjoins Newcastle Airport to the north, the Astra Aerolab Defence and Aerospace Technology Park development site to the south, sewage treatment ponds to the east and Lake Cochran and a dense concentration of trees to the west. The BAE site comprises several existing facilities and hangars, carparks and a former helicopter landing area. The section of the Study area located on private land encompasses a large area of recently rammed earth proposed for future NAPL developments. A grassed easement located between Commonwealth and private land is along the south and south eastern sections of the BAE site

The boundary of the Study area for this assessment represents the physical extent of potential Project activities and infrastructure.

Figure 1 Location of study area

Figure 2 BAE lease boundary within the study area

2.0 Legislative Context

The Study area is predominately Defence-owned and controlled land subject to Commonwealth legislation. Activities on Commonwealth property are generally not subject to State or local government environmental requirements. However, Defence Instructions (General) Admin 40-2 (Environment and Heritage Management in Defence) state that Defence will aim to comply with State and local government legislation and requirements to the extent that these do not conflict with Commonwealth legislation obligations or compromise operational capability.

The portion of the Study area located outside the BAE site is private land currently undergoing purchase by NAPL. This area is subject to NSW State legislation.

Commonwealth and State legislation relevant to the Study area are outlined below.

2.1 Commonwealth Legislation

2.1.1 Native Title Act 1993 (Cth)

The *Native Title Act 1993* (NTA) provides for the recognition and protection of native title for Aboriginal peoples and Torres Strait Islanders. The NTA recognises native title for land over which native title has not been extinguished and where persons able to establish native title are able to prove continuous use, occupation or other classes of behaviour and actions consistent with a traditional cultural possession of those lands. It also makes provision for Indigenous Land Use Agreements (ILUA) to be formed as well as a framework for notification of Native Title Stakeholders for certain future acts on land where Native Title has not been extinguished.

Searches of the National Native Title Register, Register of Native Title Claims and Register of Indigenous Land Use Agreements were undertaken on 17 November 2020 for the Port Stephens LGA. These searches returned no active or pending native title listings for the Study area.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000. Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a Matter of National Environmental Significance may only progress with approval of the Commonwealth Minister for the Environment. An action is defined as a project, development, undertaking, activity, series of activities, or alteration. An action will also require approval if:

- It is undertaken on Commonwealth land and will have or is likely to have a significant impact;
- It is undertaken outside Commonwealth land and will have or is likely to have a significant impact on the environment on Commonwealth land; and
- It is undertaken by the Commonwealth and will have or is likely to have a significant impact.

The EPBC Act defines ‘environment’ as incorporating both natural and cultural environments and therefore includes both historical and Aboriginal heritage. Under the Act, protected heritage items are listed on the National Heritage List (NHL) (items of significance to the nation) or the Commonwealth Heritage List (CHL) (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE), which was closed in 2007 and is no longer a statutory list. Statutory references to the RNE in the EPBC Act were removed on 19 February 2012. However, the RNE remains an archive of over 13,000 heritage places throughout Australia.

Searches of the NHL, CHL and RNE were undertaken on 16 November 2020. There are currently no items listed on the NHL, CHL or RNE located within the Study area. The RAAF Base Williamtown Group is listed on the CHL; however, the heritage listed curtilage does not incorporate the Study area. As such, a referral to the Commonwealth Minister for the Environment under the EPBC Act with respect to heritage is not required.

2.1.3 RAAF Base Williamtown and Salt Ash Weapons Range, Williamtown – Heritage Management Plan 2008

While not located within the heritage listed curtilage of the RAAF Base Williamtown, a portion of the Study area lies partly within the curtilage of the RAAF Base Williamtown, managed under the current *RAAF Base Williamtown and Salt Ash Air Weapons Range – Williamtown Heritage Management*

Plan, 2008 (HMP) (Woodhead International, 2008)[2]. The HMP has been prepared to satisfy the heritage conservation requirements of the EPBC Act and provides policy guidelines and specific recommendations for the management of the identified and potential cultural heritage values of the RAAF Base Williamtown. All impacts within this land must comply with the principles and policies outlined in the HMP.

The Study area is located within a section of the RAAF Base Williamtown designated as 'Zone 4 – RAAF Base Williamtown Free Area' (Figure 3). No Indigenous cultural heritage values have been identified in this zone, and HMP Management Schedules identify the need for consultation with local Indigenous groups only where change or monitoring is required within 100 m of Zone 2 sensitive areas. Similarly, Zone 4 has been identified as containing limited historic heritage values.

2.1.4 Airports Act 1996 (Cth)

The *Airports Act 1996* (Airports Act) outlines regulator

y arrangements applying to airports formerly managed by the Commonwealth. The Airports Act includes statutory requirements for airport-lessee companies to prepare environmental strategies as part of their overall airport Master Plans.

Newcastle Airport does not fall under the Airports Act, as the airport operates under a direct lease agreement with the Department of Defence; however, NAPL aim to comply with the practical guidelines for producing airport management strategies as outlined in the Airports Act. Preparation of an Environment Management Strategy is a key aspect addressed within the 2018 Newcastle Airport Master Plan, as indicated in the *2036 Newcastle Airport Vision* (Newcastle Airport Pty Ltd, 2016).

As documented by NAPL, with the exception of those areas already listed on the CHL and NSW Aboriginal Heritage Management System (AHIMS), the presence of Aboriginal sites and historic relics within NAPL land has been assessed as unlikely, due to high levels of disturbance resulting from the development of the airport (Newcastle Airport Pty Ltd, 2016:27).

2.2 NSW Legislation and Regulations

2.2.1 National Parks and Wildlife Act 1974 (NSW)

The *National Parks and Wildlife Act 1974* (NPW Act), administered by Heritage NSW, of the Department of Premier and Cabinet (DPC), is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NPW Act gives the Secretary of DPC responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

an Aboriginal object is any deposit, object or material evidence (that is not a handicraft made for sale) relating to the Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains); and

an Aboriginal place is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them and includes a 'strict liability offence' for such harm. A 'strict liability offence' does not require someone to know that it is an Aboriginal object or place they are causing harm to in order to be prosecuted. Defences against the 'strict liability offence' in the NPW Act include the carrying out of certain 'Low Impact Activities', prescribed in Clause 80B of the National Parks and Wildlife Amendment Regulation 2010 (NPW Regulation), and the demonstration of due diligence.

An Aboriginal Heritage Impact Permit (AHIP) issued under Section 90 of the NPW Act is required if impacts to Aboriginal objects and / or places cannot be avoided. An AHIP is a defence to a prosecution for harming Aboriginal objects and places if the harm was authorised by the AHIP and the conditions of that AHIP were not contravened. Applications for an AHIP must be accompanied by assessment reports compiled in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and the *Code of Practice for Archaeological*

[2] A more recent HMP has been prepared for the RAAF Base Williamtown and Salt Ash Air Weapons Range (Environmental Resources Management Australia Pty Ltd (ERM), 2018a); however, as this document has not yet been endorsed by the Heritage Council of NSW, the 2008 HMP still applies.

Investigation of Aboriginal Objects in NSW (DECCW, 2010b). Applications must also provide evidence of consultation with the Aboriginal communities. Consultation is required under Part 8A of the NPW Regulation and is to be conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010a). AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Section 89A of the NPW Act requires notification of the location of Aboriginal sites within a reasonable time, with penalties for non-notification. Section 89A is binding in all instances.

2.2.2 Environmental Planning and Assessment Act 1979 (NSW)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) allows for the preparation of planning instruments to direct development within NSW. This includes Local Environment Plans (LEPs), which are administered by local government, and principally determine land use and the process for development applications. LEPs usually include clauses requiring that heritage be considered during development applications and a schedule of identified heritage items be provided. The EP&A Act also allows for the gazettal of State Environmental Planning Policies (SEPPs).

2.2.3 Heritage Act 1977 (NSW)

The *Heritage Act 1977* (as amended) was enacted to conserve the environmental heritage of NSW. Under Section 32, places, buildings, works, relics, movable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the NSW SHR. Items that are assessed as having State heritage significance can be listed on the SHR by the Minister on the recommendation of the Heritage Council of NSW.

Proposals to alter, damage, move or destroy places, buildings, works, relics, movable objects or precincts protected by an IHO or listed on the SHR require an approval under Section 60. There are no items of State heritage significance listed on the SHR within the Study area.

Under Section 170 of the *Heritage Act 1977*, NSW Government agencies are required to maintain a register of heritage assets. The register places obligations on the agencies, but not on non-government proponents, beyond their responsibility to assess the impact on surrounding heritage items. No Section 170 listed items have been identified within the Study area.

Archaeological features and deposits are afforded statutory protection by the ‘relics provision’. Section 4(1) of the *Heritage Act 1977* (as amended 2009) defines ‘relic’ as follows:

- any deposit, artefact, object or material evidence that:

a) relates to the settlement of the area that comprises NSW, not being Aboriginal settlement, and

b) is of State or local heritage significance.

The ‘relics provision’ requires that no archaeological relics be disturbed or destroyed without prior consent from the Heritage Council of NSW. Therefore, no ground disturbance works may proceed in areas identified as having archaeological potential without first obtaining an Excavation Permit pursuant to Section 140 of the *Heritage Act 1977*, or an Archaeological Exception under Section 139 of the *Heritage Act 1977*.

The Heritage Council of NSW must be notified of the discovery of a relic under Section 146 of the *Heritage Act 1977*.

2.2.4 Port Stephens Local Environmental Plan (LEP) 2013

The Study area is located wholly within the Port Stephens Local Government Area (LGA), in which the relevant Environmental Planning Instrument (EPI) is the Port Stephens Local Environmental Plan (LEP) 2013. Part 5 (Section 5.10) of the Port Stephens LEP 2013 provides specific provisions for the protection of heritage items and relics within the Port Stephens LGA. In relation to heritage conservation, the LEP states the following:

(1) The objectives of this clause are as follows:

a. to conserve the environmental heritage of Port Stephens;

b. to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,

c. to conserve archaeological sites,

d. to conserve Aboriginal objects and Aboriginal places of heritage significance.

(2) Development consent is required for any of the following:

(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):

(i) a heritage item,

(ii) an Aboriginal object,

(iii) a building, work, relic or tree within a heritage conservation area,

(b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item,

(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,

(d) disturbing or excavating an Aboriginal place of heritage significance,

(e) erecting a building on land:

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,

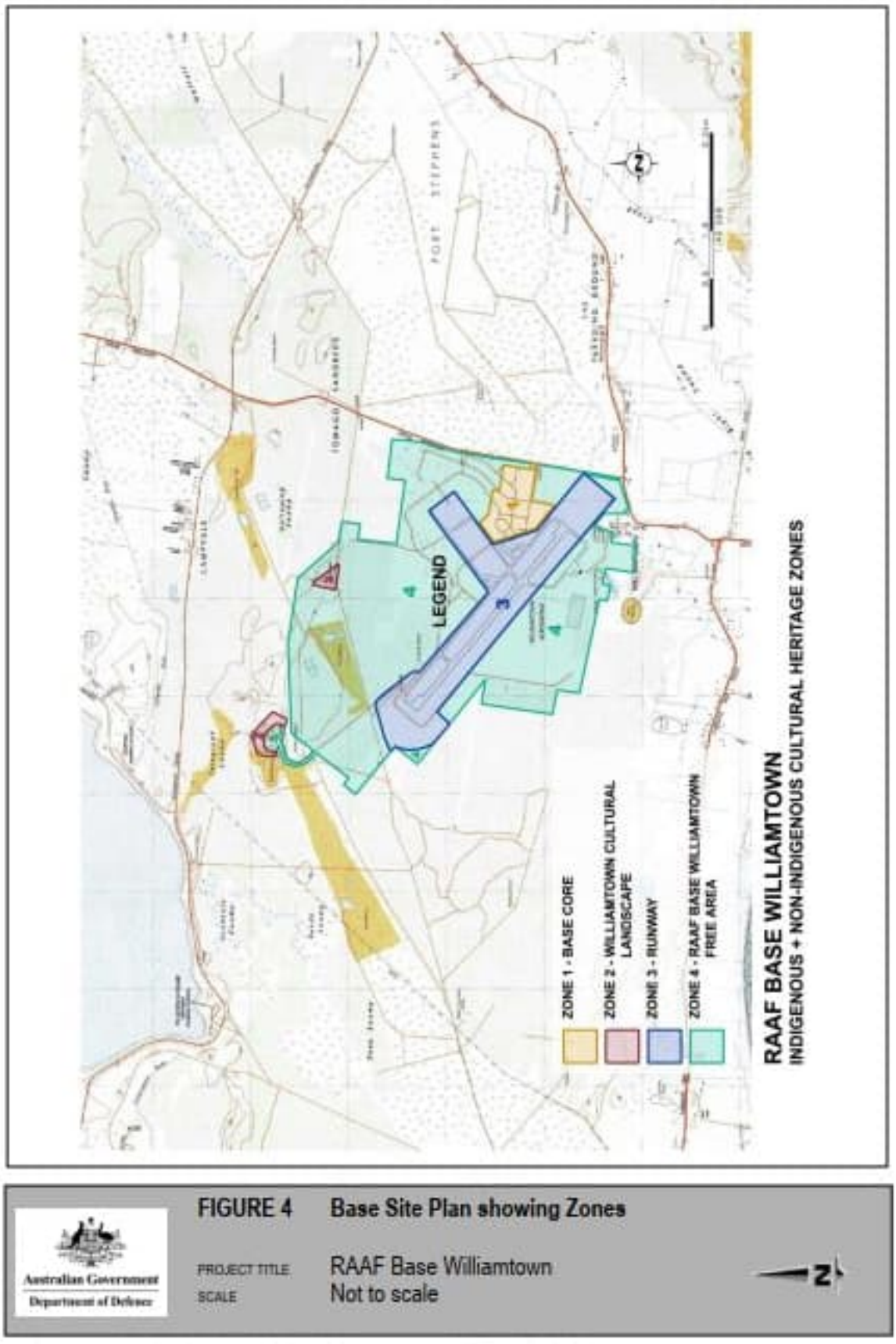
(f) subdividing land:

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance

Schedule 5 of the Port Stephens LEP 2013 provides a list of heritage items within the Port Stephens LGA. There are no Aboriginal or historic heritage items listed in this schedule that fall within the Study area.

Figure 3 HMP Heritage Management Zones (Woodhead International, 2008:71). Study area shown red.



3.0 Data Sources

Information regarding the known and potential Aboriginal and historic heritage resource of the Study area was obtained from:

- A search of the National Native Title Register (NNTR) and Register of Native Title Claims (RNTC) administered by the National Native Title Tribunal (NNTT) for land within and surrounding the Study area;
- A review of the landscape context of the Study area and surrounds;
- A review of existing Aboriginal Heritage Information Management System (AHIMS) data for land within and surrounding the Study area, obtained from Heritage NSW, DPC on 16 November 2020 (AHIMS ID #549926);
- A review of the findings of past Aboriginal archaeological investigations within the local area;
- A search of relevant heritage registers; and
- A visual inspection of the Study area by AECOM Archaeologist Julia Atkinson.

4.0 Aboriginal Heritage

4.1 Native Title

A search of the National Native Title Register online Native Title Vision database was undertaken on 25 August 2022 for *Schedule of Applications (unregistered claimant applications*), *Register of Native Title Claims*, *National Native Title Register*, *Register of Indigenous Land Use Agreements* and *Notified Indigenous Land Use Agreements*. These searches returned no registered native title determinations, claims or ILUAs.

4.2 Landscape Context

Consideration of the landscape context of the Study area is predicated on the now well-established proposition that the nature and distribution of Aboriginal archaeological materials are closely connected to the environments in which they occur. Environmental variables such as topography, geology, hydrology and the composition of local floral and faunal communities will have played an important role in influencing how Aboriginal people moved within and utilised their respective Country. Amongst other things, these variables will have affected the availability of suitable campsites, drinking water, economic plant and animal resources, and raw materials for the production of stone and organic implements. At the same time, an assessment of historical and contemporary land use activities, as well as geomorphic processes such as soil erosion and aggradation, is critical to understanding the formation and integrity of archaeological deposits.

Key observations from a review of the landscape context of the Study area are presented in Table 1.

Table 1. Review of landscape context of the Study area

Environmental Variable	Key Observations
Geomorphology and Topography	The Study area is located within the Newcastle Bight embayment, the largest sedimentary basin of Quaternary age in the greater Port Stephens-Myall Lakes region (Thom et al. 1992). Bordered to the south by the Hunter River and the north by an outcrop of Nerong Volcanics at Lemon Tree Passage, this broad, south-southeast facing embayment is dominated by an extensive sand barrier system consisting of an inner Pleistocene barrier (the 'Inner Barrier'), an outer Holocene barrier (the 'Outer Barrier') and a broad 'Inter-barrier Depression' filled with reworked Pleistocene transgressive sand dune fields and Holocene estuarine swamp deposits. Reference to Thom *et al.'s* (1992) generalised morphological map of the Newcastle Bight embayment (**Figure 4**) indicates that the Study area is located towards the western end of the Pleistocene transgressive dune field located within the Inter-barrier Depression. This area is characterised by poorly-drained swales and depressions that accommodates freshwater swamp forest. Local relief of the dune field rarely exceeds 1 m Australian height Datum (AHD) and consists of broad, irregular sandy rises and aeolian deflation basins (Matthei, 1995). The sandy ridges within portions of the transgressive dune field are generally well-drained but the lower elevated swales are seasonally waterlogged. Topographic mapping of the Study area indicates that no raised dunes are present; however, extensive grading and site levelling works have likely altered the pre-European landscape. Outside of the Study area, however, local topography peaks at 10 m AHD in remnant sand dunes located approximately 100 m south east. These areas of stabilised higher terrain have been associated with surface and subsurface expressions of Aboriginal archaeology and would have provided more suitable conditions for occupation sites than lower lying areas due to better drainage and shelter.

Environmental Variable	Key Observations
Hydrology	Owing to highly permeable soil materials, there are no permanent or ephemeral freshwater creeks present within the stabilised or mobile portions of the transgressive dune field sand mass. However, potable water can be found in pockets of freshwater swamps occupying low-lying, poorly drained swales and depressions, where a permanent water table is typically present within 30 cm of the ground surface (Matthei, 1995: 217). These areas would have provided important sources of drinking water and other resources. Prior to historic draining for grazing, water supply schemes and the construction of the RAAF Base Williamtown, the Inter-barrier Depression seaward of the transgressive dune field would have consisted of an extensive estuarine swamp environment subject to the daily tidal cycle of the Pacific Ocean. The Inter-barrier Depression is drained principally by Tilligerry Creek, a regionally significant estuarine watercourse, located approximately 1.6 km south east of the Study area, that rises along the eastern shore of Fullerton Cove and discharges into Port Stephens. Natural flows along Tilligerry Creek have been substantially altered by an extensive network of floodgates and constructed drains. Upstream of the Tilligerry Creek Floodgates, which provide an artificial tidal limit, the creek comprises a freshwater stream. However, downstream of this point, it remains estuarine. Fullerton Cove is a shallow protected estuarine lagoon, located approximately 3.3 km south west of the Study area, with an approximate area of 9.5 km^2. The outer areas of Fullerton Cove, closest to land, consist mainly of tidal mudflats which provide suitable conditions for mangrove habitat. During high tide, the water depth in the open water part of Fullerton Cove reaches up to 2 m. During low tide, the water drains almost entirely. Within the vicinity of the Study area, a number of artificial lakes and ponds have been constructed, including Lake Cochran and sewage treatment ponds. Water also periodically collects in drainage depressions across the site, including one located along the south western boundary of the former helicopter site; however, no permanent freshwater source is known.
Surface geology and soils	Reference to the Nelson Bay 1:25 000 Quaternary Geology Map Sheet (Hashimoto & Troedson, 2008) indicates that the near surface geology of the Study area consists principally of Pleistocene coastal barrier dunes, comprising fine to very fine quartzose marine sands and indurated sands Soils within the Study area have been mapped by Matthei (1995) as the Tea Gardens (tn) soil landscape (specifically the Tea Gardens ‘variant a’), comprising aeolian-reworked Pleistocene sand sheets within wet heath forest. Dominant soil materials for these landscapes have been described as consisting of poorly drained Peaty/Humus Podzols in swales and deep (>200 cm), very poorly drained Acid Peats in swamps. No outcrops or deposits of stone(s) suitable for the production of flaked stone artefacts are present within or immediately surrounding the Study. However, it is noted that local flaked stone artefact assemblages attest to an emphasis on the procurement and reduction of fine-grained volcanic tuffs, often cream or grey in colour. Such tuffs occur in a number of Permian era geological units on the peripheries of the Newcastle Bight embayment (e.g.,

Environmental Variable	Key Observations
	Newcastle Coal Measures, Tomago Coal Measures and Dalwood Group) and appear to have been sourced from both bedrock outcrops and alluvial gravel deposits. Nobbys Tuff, the best known of the utilised volcanic tuffs outcrops at Nobbys Head approximately 13 km southwest of the Study area.
Flora and fauna	Native vegetation within the Study area has been extensively modified as a result of previous land use activities, with historic aerial photographs indicating the vast majority of the Study area containing only sparse vegetation in 1947. Vegetation today consists principally of a mixture of derived native and exotic grassland and landscaped gardens within the Study area. Historical clearance notwithstanding, available reference materials and field observations of remnant species are suggestive of a former vegetative cover of estuarine-adapted swamp forest, with key species including *Casuarina glauca* (Swamp Oak) and *Melaleuca quinquenervia* (Broad-leaved Paperbark), (Matthei, 1995:188) (Matthei 1995: 188). These species are still observed immediately east and west of the Study area. While available historical records provide only limited insight into Aboriginal exploitation of plants across the Hunter Valley (Brayshaw, 1987), it can be confidently asserted that the original vegetation communities of the Study area and its surroundings would have supplied Aboriginal people camping within or travelling through this area with an extensive array of edible and otherwise useful plant species. Recorded native vegetation communities, locally occurring watercourses and estuarine areas would also have supported a large and diverse array of economic terrestrial, aquatic and avian fauna.
Historical land use and disturbance	Alongside field observations, historical maps and aerial photographs provide an avenue for assessing the nature and extent of post-European settlement land use activities and ground disturbance across the Study area. The first land grants in the area were in 1839 and 1840; however, little is known about developments undertaken within the land at that time (Environmental Resources Management Australia Pty Ltd (ERM), 2018:11). Impacts associated with subsequent dairying industries and coal mining measures, however, likely resulted in disturbance to the Study area in the form of extensive vegetation clearance from the turn of the late 19th to early 20th Centuries. By 1922, maps of Stowell Parish indicate that the majority of the Study area was reserved for the Tomago Sandbed Water Supply Scheme. Following World War II, the land was resumed by the Commonwealth for use as an airbase and the later development for RAAF Base Williamtown. Aerials from as early as 1947 indicate a range of activities and associated ground surface impacts. Those of particular relevance to the current investigation include: • Extensive native vegetation clearance pre- and post-1947; Coal and sand mining activities; • Artificial drainage construction and damming; • Extensive site levelling, infill and paving for construction of runways and airport facilities; • Utility installation; • Road construction and light vehicle track construction / use; and • The construction of BAE facilities since 1999 and recent in-fill and site levelling of the adjacent NAPL site.

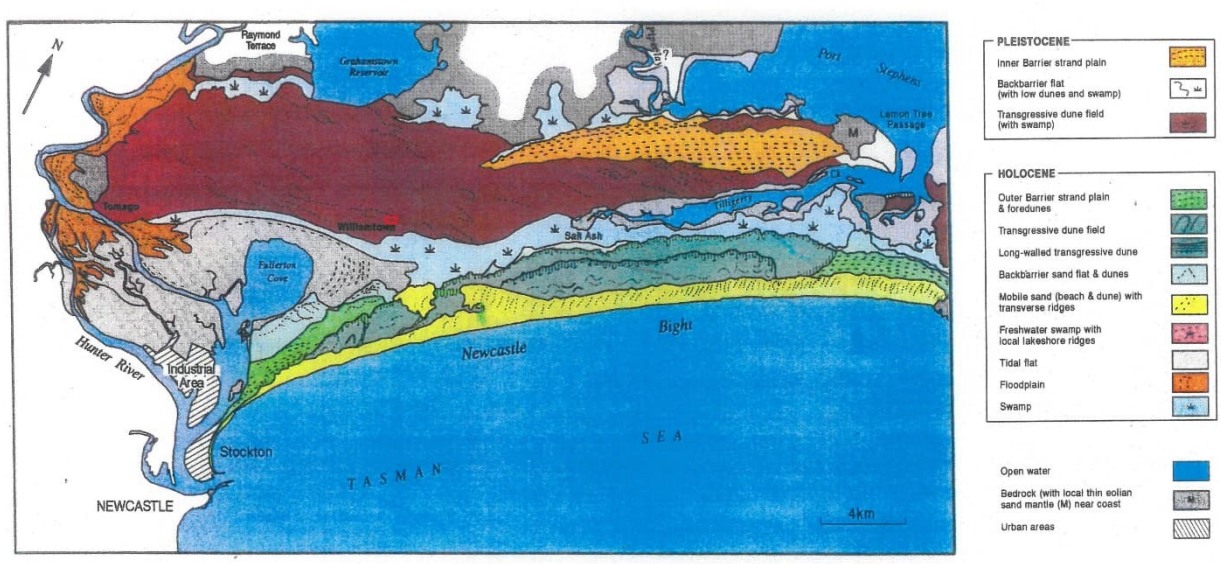


Figure 4 Thom *et al.*'s (1992) generalised morphological map of the Newcastle Bight embayment, with general location of Study area indicated red.

4.2.1 Key Findings

Key findings to be drawn from a review of the existing landscape context of the Study area are as follows:

- The Study area lies within the lower-lying south western portion of the Pleistocene transgressive dune field, part of the Inter-barrier Depression of the Newcastle Bight Sand Dune System. Elevations within the lower-lying transgressive dune field rarely exceed 1 m AHD;
- Elevated, low gradient dune surfaces that likely would have been favoured for occupation (albeit short-term) are absent from the Study area. Remnant sand dunes associated with surface and subsurface Aboriginal sites are located approximately 100 m south of the Study area;
- Pockets of freshwater swamp forest, which would have served as focal resource areas for Aboriginal people occupying or traversing the stabilised portions of the Inner Barrier sand mass throughout the Late Pleistocene, are absent from the Study area. The nearest permanent watercourse to the Study area is Tilligerry Creek, located approximately 4 km to the east;
- Outcrops and/or deposits of stone suitable for the production of flaked stone artefacts are not present within or immediately surrounding the Study area;
- Prior to European settlement, the floral and faunal resources of the Study area would have been sufficient to facilitate intensive and / or repeated occupation by Aboriginal peoples; and
- Examination of historic aerial photographs indicates that the Study area consists of a highly disturbed landscape, resulting from extensive early vegetation clearance, mining and water supply activities, levelling and in-fill for the development of RAAF Base Williamtown and Newcastle Airport, and the construction of more recent BAE and NAPL facilities.

4.3 Aboriginal Archaeological Context

4.3.1 AHIMS Search

The Aboriginal Heritage Management System (AHIMS) database, administered by Heritage NSW, contains records of all Aboriginal objects reported to the Secretary of DPC in accordance with Section 89A of the NPW Act. It also contains information about Aboriginal places, which have been declared by the Minister to have special significance with respect to Aboriginal culture. Previously recorded Aboriginal objects and declared Aboriginal places are known as 'Aboriginal sites'.

A search of the AHIMS database on 25 August 2022 (AHIMS search ID: 711485) undertaken for a 3 x 3 km area centred on the Study area (i.e. the 'AHIMS search area'), returned a total of nine (9) registered sites comprising eight open artefact sites, one with an associated area of Potential Archaeological Deposit (PAD), and one burial. Table 2 provides a summary of the search result details for valid sites.

No AHIMS sites are registered within the Study area and no sites are registered within 100 metres of the Study area. The closest valid site comprises an artefact scatter registered approximately 125 m south east of the Study area within a remnant sand body (AHIMS site: 38-4-1146). All other sites are located greater than 300 metres from the Study area. The distribution of registered sites with relation to the Study area is shown on Figure 5 and Figure 6. However, it should be noted that AHIMS search result data are known to contain multiple issues, such as coordinate accuracy observed from past assessments. The given coordinates also only represent a centroid, not the full extent of a site's area.

Table 2. AHIMS Search Results for Valid Sites

Site Type	Archaeological Site Feature(s)	Count (n)	Percent (%)
Open Artefact Site	Artefact/s; Potential Archaeological Deposit	8	88.9
Burial	Artefact/s; Burial	1	11.1
Total		**9**	**100%**
Source: Heritage NSW, Department of Premier and Cabinet, 25 August 2022 (AHIMS search ID 711485)			

4.3.2 HMP 2008

As RAAF Base Williamtown is located on Commonwealth-owned land, Aboriginal sites identified within the curtilage of the Base do not require listing on the AHIMS database. Indigenous cultural heritage values and sites, however, have been identified and assessed within the HMP. The heritage values of the Base have been assessed within the HMP and four zones of cultural heritage management have been designated (refer to Figure 3) (Woodhead International, 2008:40-42). Indigenous cultural heritage values have been identified within Zone 2 – Williamtown Cultural Landscape and Zone 3 - Runway.

Zone 2 is associated with the presence of archaeologically sensitive, remnant Pleistocene sand dunes, located to the north west of the Base. These areas have not been subject to extensive reshaping for the Base development and contain identified Indigenous cultural heritage values for their sensitive landform and previous finds. Large numbers of flaked stone artefacts were recorded within Galloping Swamp Dune during previous mineral sand mining operations, and the undisturbed portion of the dune contains further potential for in situ archaeological material of high to very high significance. While no archaeological material has been documented for Duckhole Hill, a burial on the north west flank was reportedly observed in the 1960s and the elevated landform has been assessed as archaeologically sensitive.

Zone 3 is associated with early reports of skeletal remains found during the construction of the runway. While the levelling of the site and construction of the runway is likely to have destroyed any skeletal material, the area retains cultural significance for this association and potential archaeology.

The portion of the Study area located within land covered under the 2008 HMP is designated as Zone 4 – RAAF Base Williamtown Free Area. No Indigenous cultural heritage values have been identified within this area.

Figure 5 **Registered AHIMS site centroids**

Figure 6 **Registered AHIMS site centroids – full search area**

4.3.3 Previous Aboriginal Archaeological Assessments

Existing AHIMS data indicate that numerous Aboriginal cultural heritage assessments incorporating survey and/or subsurface investigations have been undertaken in the greater Williamtown-Fullerton Cove-Fern Bay-Medowie area since the late 1980s. Noteworthy investigations to date have included those carried out by Byrne (1987), Dean Jones (1990, 1992), Baker (1994), Umwelt (1997, 2000, 2011), ERM (2003, 2005) and McCardle Cultural Heritage (2008, 2012).

For contextual purposes, the results of these assessments are summarised in Table 3.

Table 3. Previous Aboriginal Archaeological Assessments within the Local Area

Reference	Project / Location	Investigation Type	Summary of investigation and results
(Byrne, 1987)	132kv transmission line between Williamtown and Anna Bay	Survey	Pedestrian survey of c.20 km long by 30 m wide 132kv electricity transmission line easement between Williamtown and Anna Bay. Byrne (1987: 6) reports that approximately 40% of the easement was subject to survey. One archaeological site - Boyces Track #1 - identified during survey. This consisted of a small exposure of pipi midden on a deviation track running west off Boyces Track. Byrne (1987: 7) describes the site as consisting of a 5 cm thick layer of 'eroded' pipi shell in a shallow, exposed soil profile on the southern edge of the track in question. The midden deposit was located 5 cm below the ground surface and was exposed for a length of 70 cm. Byrne (1987) concluded that the midden deposit likely extended beyond shell-bearing exposure. No stone artefacts or other cultural materials were noted in association with the midden deposit. In addition to the subsurface midden deposit, a low-density scatter of pipi shell was observed on the surface of the deviation track between the site and Boyces Track.
(Dean-Jones, 1990)	Newcastle Bight Aboriginal Sites Study	Survey	Regional-scale assessment of the Aboriginal archaeological record of Newcastle Bight aimed broadly at locating, recording and assessing the significance and sensitivity of Aboriginal archaeological sites at Newcastle Bight. A total of ten geomorphic units sampled via targeted pedestrian and/or vehicle transects. A total of 119 sites recorded during survey, with an additional 40-50 midden sites noted in Dean Jones' (1990) 'Beach, foredune & swale' geomorphic unit but not recorded due to time constraints. Identified sites divided into 14 types, the majority (n = 10) of which can be broadly characterised as midden sites. Dean-Jones (1990: 16) notes that 73.4% of identified sites included at least a thin scatter estuarine or marine shell. However, dense concentrations of packed shell were rare, occurring in only 12.3% of sites. Small numbers of stone artefacts (<5) observed in "many sites", particularly thin, disturbed shell scatters (Dean-Jones 1990: 16). High density concentrations of flaked stone

Reference	Project / Location	Investigation Type	Summary of investigation and results
			artefacts restricted to two types of identified site: 1) midden complexes associated with stable late Holocene dune surfaces overlooking the deflation basin at the rear of the beach; and 2) open campsites on Pleistocene dunes associated with freshwater wetlands, and also Holocene estuarine wetlands. On the basis of the survey results summarised above, Dean-Jones (1990) identified the following geomorphic environments within the Newcastle Bight sand mass as being of high archaeological sensitivity: 1) the outer margin of the active transgressive dunes and inland margin of the deflation basin; 2) transgressive dune surfaces on either side of the Inter-barrier Depression; and 3) the relict beach ridge plain at the north eastern end of the outer barrier.
(Dean-Jones, 1992)	Fern Bay	Survey and test excavation	Survey and test excavation program undertaken as part of archaeological assessment for broad-area rezoning application at Fern Bay. Land units surveyed included the stabilised (Ridge I and II) and active (Ridge III) dune fields, the relict deflation basin separating Ridge I and II and the modern deflation basin. Nineteen sites, comprising shell midden and open artefact sites, identified during field survey. Majority located on ridges within the Ridge I dune field. Three out of four sites identified along the landward margin of the modern deflation basin occurred in direct association with exposures of remnant stable soil surfaces. No sites located within relict deflation basin. Subsurface testing undertaken at three sites within the Ridge I dune field to provide further information on site content and structure. Testing also undertaken at three locations within the Ridge II dune field to determine whether the paucity of surface sites in this environment equated to a lack/paucity of subsurface evidence. Shovel testing at the three sites within the Ridge I dune field revealed discrete concentrations of shell and flaked stone and demonstrated the presence of archaeological material up to 90 cm below current ground surface. No subsurface archaeological materials were identified at the areas tested within the Ridge II dune field. Dean-Jones' key conclusions for this project were as follows: Archaeological evidence is concentrated on elevated ground but not necessarily on the main or higher ridge crests;

Reference	Project / Location	Investigation Type	Summary of investigation and results
			Archaeological evidence is widespread along the entire inner (landward) margin of the Ridge I dune field. These dunes have remained relatively stable over the period of estuarine filling of the Inter-barrier Depression; Archaeological evidence within the Ridge II dune field is rare, except along its seaward margin. No sites were recorded along the inner margin of this due system; There appears to be a relationship between site distribution and the presence of freshwater wetlands within the dune field; Sites in the dune field include shell only, flaked stone only or both flaked stone and shell; The distribution of shell species across the dune field suggest that shellfish obtained from estuarine and marine sources were not carried across the barrier system. Sites with pipi are confined to the outer margin of the barrier, and sites with Pyrazus and Oyster are distributed across the inner part of the barrier; and There is abundant evidence of occupation along the outer margin of the active transgressive dunes. This evidence includes both midden shell and flaked stone and is typically both fragmented and heavily weathered.
(Baker, 1994)	Heavy mineral mining, Moffats Swamp, Medowie	Archaeological salvage program incorporating subsurface testing, salvage excavation and surface collection	Multi-component archaeological salvage program undertaken at Moffats Swamp adjacent to inner barrier strand plain. Excavation component of program involved excavation of four 1 x 1 m pits and a single 3 x 3 m pit around periphery of existing dredge pond. All excavations were taken to a depth of approximately 1 m b.g.l. The 3 x 3 excavation, designated as the “pond upper” excavation, was carried out in a dune crest context. A total of 4,088 flaked stone artefacts and 226 “shattered fragments” were recovered from this larger excavation, with individual square totals for definite artefacts ranging from 309 to 612 (average = 454.2/m^2). Three AMS radiocarbon dates were obtained for the “pond upper” excavation, one from Square A1 and two from Square B3. That from Square A1 (i.e., 14,750±130 BP (NZ 3016)), obtained on a charcoal sample recovered from Spit 6, 70 to 80 cm below the surface, was argued to signal Aboriginal peoples’ first initial occupation of the site. However, a charcoal sample from the same level in Square B3 yielded a date of only 7,566±114 BP (OZA 257). Dates for Square B3 were also internally inconsistent, with that from Spit 3 (11,351±143 BP (OZA 256) significantly older than that from Spit 5 (7,566±114 BP). A key objective of Baker’s technological analysis of the flaked stone artefact assemblage recovered from Moffats Swamp Dune (MSD)

Reference	Project / Location	Investigation Type	Summary of investigation and results
			was to compare it with that recovered from the undated Galloping Swamp Dune (GSW), located nearby. Ultimately, a total of 6,190 artefacts from MSD and 583 artefacts from GSW were subject to technological analysis. The MSD assemblage was dominated by artefacts manufactured out of Nobbys tuff, with silcrete artefacts also well represented. Other, minor raw materials included petrified wood, quartz, quartzite, 'volcanic', 'metamorphic' and 'fine grained siliceous'. Tuff occurred in a sightly proportion in the GSW assemblage. Extant cortical surfaces in both assemblages attested to the exploitation of water-rolled pebbles/cobbles. The MSD assemblage was dominated by flake debitage items, with non-flake debitage comparatively poorly represented. Formed objects included 141 cores, 95 retouched flakes and 15 'retouched pieces'. Five hammerstones were also recovered. Notably, multivariate analyses of the complete flake and formed components of a series of assemblages from the Hunter and Goulburn River valleys, including the MSD and GSW flake assemblages, indicated a "significant relationship" between the technologies represented by the MSD and GSW assemblages, which Baker characterised as "quite expedient".
(Umwelt (Australia) Pty Ltd, 1997)	Fullerton Project, southwestern end of outer barrier	Survey and test excavation	Survey and test excavation program for proposed sand mining operation (Fullerton Project) at the southwestern end of the Outer Barrier. Project area for investigation included the modern deflation basin, mobile dune sheet, stabilised 1200 BP dune (Ridge II) and the relict deflation basin separating Ridge II and the mobile dune sheet. Field survey component of investigation located 19 remnant topsoil exposures, 11 of which were associated with archaeological material, either on the surface of the topsoil profile, or immediately downslope. Majority of exposures located on coastward ridge of the mobile dune sheet and characterised by 'ridges' of black topsoil varying in width from 1-1.5 m. All identified exposures interpreted by Umwelt (1997) as belonging to the 1200 BP (Ridge II) dune. Total of 77 flaked stone artefacts, consisting of two cores, 22 flakes, four retouched flakes (incl. two backed artefacts) and 49 flaked pieces, recovered from identified topsoil exposures. Cluster of artefacts identified at one exposure interpreted as possible knapping floor. No evidence for heat treatment noted. All identified artefacts manufactured out of Nobbys Tuff. Pipi dominant shell material.

Reference	Project / Location	Investigation Type	Summary of investigation and results
			Five exposures, four of which had flaked stone artefacts on the ground surface, sampled using shovel test pits. Three located on coastward ridge of active dune sheet, one on landward ridge and one in modern deflation basin. Number of pits per exposure ranged from 9 to 15. Two distinctive soil horizons, interpreted as 'A 'and 'B' horizons, identified, with former further differentiated into two sub horizons (i.e., A_1 and A_2). No stone artefacts recovered from any pits. No features (e.g., hearths, heat treatment pits) identified. Single lens of shell identified at A/B horizon interface in one tested exposure. Umwelt (1997: 39) concluded that this lens likely accumulated through a combination of natural and cultural processes.
(Environmental Resources Management Australia Pty Ltd, 1998)	Nelson Bay Road upgrade between Alt Ash and Bobs Farm	Survey and test excavation	Follow-up investigation to Byrne's earlier survey (1994) involving subsurface testing at four shell midden/scatter sites, three of which were identified after Byrne's (1994) survey, and additional pedestrian survey of a cleared c.3km section of the road route. Excluding the previously recorded Nelson Bay Road 1 (NBR 1) site, ERM (1998) report the identification of an additional eleven sites during the survey component of this investigation. These included two scarred trees, one of which exhibited climbing notches and was interpreted as a 'honey tree', and nine shell midden/scatter sites without stone artefacts. Three cockle shells at NBR 1 site showed signs of use-wear. Location of newly identified sites deemed consistent with Dean-Jones' (1990) finding that sites within the stabilised dune fields of the Outer Barrier tend be located on dune crests. Sites subject to subsurface testing included NBR 1, previously identified by Byrne (1994), Nelson Bay Road 4 (NBR 4) (38-4-0491), a disturbed midden containing cockle, mud whelk and pipi shell, Nelson Bay Road 5 (NBR 5) (38-4-0492), another disturbed midden containing cockle, mud whelk, oyster and pipi shell, and Nelson Bay Road 7 (NBR 7) (38-4-0483), a midden, likewise disturbed, containing cockle and mudwhelk shell. The number of test 'probes' excavated at these sites ranged from one at NBR 7 to 27 at NBR 4. At NBR 1, 4 and 5, test probes were "placed initially within the areas of the densest shell material" but were also "extended into area with little or no shell to test for buried material" (ERM 1998: 3.1). In general, test probes at all sites confirmed the presence of shallow subsurface deposits of

Reference	Project / Location	Investigation Type	Summary of investigation and results
			shell. Shell, where present, was restricted to, or concentrated in, the top 10 cm of excavated soil profiles, leading ERM (1998: 4.1) to conclude "that 5 cm would be the maximum proven depth of the [tested] middens". At NBR4 and 5, the presence of spatially discrete concentrations of estuarine and marine shellfish were interpreted as products of discrete consumption "events". No other cultural materials (e.g., stone artefacts, bone) were identified during the subsurface testing program.
(Umwelt (Australia) Pty Ltd, 2000)	Fullerton Project / southwestern end of outer barrier	Survey	Archaeological survey of c.1,000 ha study area at the southwestern end of outer barrier undertaken as part of a comprehensive, multi-component Aboriginal archaeological assessment for BHP's Fullerton Project. Study area for this assessment included the beach and foredune, modern deflation basin and elevated transgressive dune sheet. Total of 33 Aboriginal sites, consisting of five open artefact sites and 28 midden sites, identified during survey. Fourteen sites defined by midden shell alone, with no flaked stone or bone observed. Twenty-eight sites included pipi shell considered to be of archaeological origin. Majority of sites (n = 22, 66.6%) located within modern deflation basin. Remaining sites located on lower seaward slopes of transgressive dune sheet. Umwelt (2000: 7.10) report that the majority of identified sites were not stratified and retained no direct association with former (i.e., Ridge I and II) soil surfaces. Total of 214 flaked stone artefacts recorded. Tuff dominant raw material. No backed artefacts observed. Limited evidence of heat treatment noted. Bone, potentially of cultural origin, noted at several sites (macropod, bird and reptile).
(Environmental Resources Management Australia Pty Ltd, 2003)	Electricity supply upgrade, Tomago to Tomaree	Survey	Combined pedestrian/vehicle survey of a c.40 km long by 15 to 50 m wide powerline easement undertaken as part of an Aboriginal cultural heritage assessment for the upgrading of electricity powerlines from Tomago to Tomaree. Study area divided into a 13 survey units, each corresponding to one of three broad geomorphic units: Pleistocene dunes, Inter-barrier Depression and Holocene dunes. Several units further subdivided on the basis of internal landform elements. Parts of one primary survey unit and three sub-units surveyed by vehicle, the remainder, on foot. Total of 15 sites identified during survey. However, three previously recorded midden 'sites' (38-4-0659, 38-4-0660 and 38-4-0661) were reassessed as natural shell deposits, leaving 12 legitimate Aboriginal archaeological sites, nine of which were new recordings.

Reference	Project / Location	Investigation Type	Summary of investigation and results
			Confirmed sites consisted exclusively of shell midden/scatter sites with (n = 7) and without (n = 5) associated stone artefacts and/or other cultural materials. Majority of sites (n = 10, 83.3%) reported as being located on Pleistocene (n = 3) or Holocene (n = 7) dune crests and/or slopes overlooking the Inter-barrier Depression. Sites A1 (38-4-0647) A2 (38-4-0468) and A10 (38-4-0676), located on a south-facing slope of a Pleistocene dune overlooking the Inter-barrier Depression, all contained backed artefacts, with 29 examples manufactured out of “various types of silcrete” and Nobby’s Tuff identified at A1. Shellfish present within these sites included cockles, oysters, and pipi. At A10, fish, lizard, bird and kangaroo bone were also observed throughout the site. Shellfish present within sites located on the landward margin of the Holocene dune system overlooking the Inter-barrier Depression included oyster, pipi, cockle and mud whelk. Kangaroo bone pieces also noted at one site (i.e., A4, 38-4-0643). Stone types utilised for flaked stone artefact manufacture at these sites included Nobby’s tuff, silcrete and chert. Backed artefacts present in three sites (A3 (38-4-0643), A4 & A5 (38-4-0650)), with thumbnail scrapers also noted in site A4. Survey results interpreted as reflecting an occupational emphasis on “dune areas overlooking the Inter-barrier Depression” (ERM 2003a: 38). Presence of estuarine and marine shellfish species at most sites argued to reflect a wide foraging range. Survey units/sub-units assessed as retaining moderate to high potential for intact archaeological/cultural deposits designated as PADs (n = 7). Within the Holocene dune system, sand hills, ridges, dune crests and slopes facing the Inter-barrier Depression identified as archaeologically sensitive. Those further away assessed as having “reduced sensitivity” (ERM 2003a: 40).
(Environmental Resources Management Australia Pty Ltd, 2005)	Fern Bay Seaside Village, Fern Bay	Test excavation	Three phase test excavation program undertaken as part of an Aboriginal heritage assessment for the ‘Fern Bay Seaside Village’ residential development at Fern Bay. Study area for investigation, which had been previously assessed by Dean-Jones (1992) (see above), included Ridge I and II ridgelines and intervening relict deflation basin. Several areas of ‘Swamp Forest’ were present within study area. Phase 1 comprised test excavation of five previously identified sites identified as having potential for stratified sub-surface deposits.

Reference	Project / Location	Investigation Type	Summary of investigation and results
			Phase 2 involved auger sampling of toposequences within the Ridge I dune field. Phase 3 comprised test excavation of areas where archaeological material was identified during Phase 2. Key conclusions for this project: Aboriginal sites found at Fern Bay are no older than 4000 BP. Prior to this time, the study area was a mobile sand dune and no archaeological evidence would have been retained because of the movement of the sand dune deflating and dispersing archaeological material; Aboriginal people were living in the study area *at least* as early as 2,600 years ago. Carbon dating of a charcoal sample from an Aboriginal hearth at Site 8 yielded a date of 2,584±45 BP; The 4000 BP stable dune ridgelines were the focus of occupation within the study area whereas the deflation basin, swamp forests and 1200 BP dune sequence were only very sparsely occupied. No archaeological material was found within 1200 BP dune sequence; Occupation of the 4000 BP stable dune ridgelines was focussed on the lower ridgelines, particularly adjacent to or between swamp forests. Low ridgelines are more sheltered from prevailing winds and are in closer proximity to the water and plant resources of the swamp forests; Marked differences in the vertical distributions of stone and shell at some sites likely reflects the decomposition of shell at depth in earlier deposits and a decline in the use of stone artefacts during recent occupation; Site content cannot be adequately assessed on the basis of surface evidence alone due to marked differences in the vertical distributions of stone and shell at some sites. The proportion of shell relative to stone is much higher on the surface than it is sub-surface; Archaeological deposits at Fern bay have stratigraphic integrity, as evidenced by a lack of evidence for artefactual size sorting in excavated deposits. The bimodal distribution demonstrated at one site provides strong evidence of site integrity; A range of activities can be inferred from the test excavations at Fern Bay, including hunting, plant processing, stone knapping, shellfish gathering and camping; The raw material used for flaked stone artefact manufacture at Fern Bay was predominantly Nobby's Tuff, with silcrete the second most common material. Proximity to raw material source appears to have been the most important consideration when selecting raw materials for artefact manufacture;

Reference	Project / Location	Investigation Type	Summary of investigation and results
			Functional analysis of a Worimi Cleaver found at Site 8 indicates that the tool was likely used for processing Bungwall Fern (*Blechnum indicum*); and Worimi Cleavers appear to have functioned as specialised implements at Stockton Bight over a period of at least 8,000 years, as evidenced by the Worimi Cleaver recovered from the charcoal matrix of the Site 8 hearth (dated to 2,584±45 BP) and one recovered from the Moffats Swamp Dune site in a context dated to c.11,000 BP (Baker 1994).
(McCardle Cultural Heritage Pty Ltd, 2008)	Sand Extraction Operation, Fullerton Cove	Survey	Pedestrian survey of proposed sand extraction site adjacent to Nelson Bay Road, previously subject to intensive mineral sands mining. Due to past ground disturbance activities, flaked stone artefacts were identified across the study area, with higher concentrations observed in the northern portion of the site. Artefacts included flakes, flaked pieces, cores and backed artefacts, with the majority manufactured out of tuff. Majority of study area designated as single Aboriginal archaeological site: Fullerton Cove Sand Extraction 1 (FCSE 1). No areas of PAD present due to past disturbances.
(RPS, 2010)	Williamtown Aerospace park	Surface collection and test excavation	Archaeological investigation undertaken for Stage 2 of the Williamtown Aerospace Park development, incorporating a portion of the current Study area. Five sites had been previously identified within the development area, four of which would be impacted by the works. The remaining site (AHIMS # 38-4-0053) was to be preserved as an Aboriginal Artefact Keeping Place. In addition to mechanical and manual surface collections across the site, two test trenches excavated on remnant dune crest (in accordance with AHIP 1101504 No. 3157). Archaeological material identified in Trench 1 only. Stone artefacts (n=1160 from excavation and 4045 from surface collections) consisted primarily of flaked pieces (with high proportions of backed artefacts); however, ground stone hatchet fragments and manuports were also identified. Primary raw material was tuff (89%), followed by silcrete (10%). Shell materials, including Anadara and Welk, faunal bone and charcoal from hearths were also present. C14 dating of charcoal deposits from two sample locations provided late Holocene dates ranging from 543 – 975 BP. High artefact densities, compact shell deposits and the presence of two hearths suggested an intensive use of the area; however, small numbers of shell and bone (indicative of food resource) indicated short-term occupations with few individuals.

Reference	Project / Location	Investigation Type	Summary of investigation and results
(Umwelt (Australia) Pty Ltd, 2011)	Underground 11 kV feeder, Medowie Road, Williamtown	Surface collection and test excavation	Subsurface testing and surface collection program for proposed 11 kV feeder (underground) on eastern side of Medowie Road, between Medowie and Williamtown. Study area for assessment comprised a c.3.5 km section of Medowie Road, between RAAF Base Williamtown and the Pacific Dunes Golf Club. Previous assessment (Umwelt, 2010a) had identified two sites within the study area (32-4-1206 & 32-4-0256), one of which was relocated during the survey component of the assessment. Umwelt's assessment also identified low-relief dunes within the study area as landform elements of high Aboriginal archaeological sensitivity. Surface collection at site 32-4-1206 resulted in the recovery of five flaked stone artefacts, all of which were manufactured out of Nobbys tuff. No surface artefacts were identified at the registered location of 32-4-0256. Test excavations were subsequently undertaken in four areas (Areas 1, 2, 3 and 5), all of which encompassed low-relief dune crests and associated gently inclined slopes. Test pits at eight locations within Area 1 yielded a total of 311 stone artefacts. Test pits at four locations within Area 2 yielded a total of 40 stone artefacts. Test pits at three locations within Area 3 yielded a total of 12 stone artefacts. Test pits at three locations within Area 5 yielded a total of 2 stone artefacts. Soil profiles typically characterised by organic rich A1 horizons and bleached A2 horizons. Silcrete was the dominant raw material in the combined flaked stone artefact assemblage (n = 343, 93%). Tuff was the second most common material (n = 26, 7%), with a single quartzite artefact also recovered. High proportion of silcrete attributed to interception of two silcrete knapping events. Assemblage dominated by flake debitage items (n = 327, 88.4%). Formed objects included six cores, two of which were made on flakes, and sixteen retouched implements. Eleven heat shatters and nine flaked pieces also recovered. Cortex poorly represented, with only six artefacts retaining cortical surfaces.
(McCardle Cultural Heritage Pty Ltd, 2012)	Northbank Enterprise Hub, Tomago	Survey	Pedestrian survey of *c*.239 ha parcel of land encompassing Inter-barrier Depression and section of low dune at the Inter-barrier Depression / Inner Barrier interface. Two shell middens and associated area of PAD identified during survey. Both middens located on dune in northernmost section of study area. One site (Tom/1) contained shell only (pipi and oyster), while the other (Tom/2) contained shell (pipi and oyster) and flaked stone artefacts (tuff). Interbarrier depression component of site

Reference	Project / Location	Investigation Type	Summary of investigation and results
			assessed as having low to no potential for Aboriginal archaeological sites.
(AECOM Australia Pty Ltd, 2019)	Dawons Drain	Survey and test excavation	Full coverage pedestrian survey and limited test excavation undertaken for the proposed rehabilitation of Dawsons Drain. No Aboriginal archaeological sites were identified. The landform, located within the Inter-barrier Depression, was assessed as wholly unsuitable for Aboriginal occupation sites.

4.3.4 Key Findings

Key findings to be drawn from a review of the local and regional archaeological context of the Study area are as follows:

No Aboriginal archaeological sites have been previously identified within or immediately surrounding the Study area;

An understanding of the geomorphic evolution of the Newcastle Bight embayment is critical to interpreting its associated Aboriginal archaeological record. Known sites occur in a variety of geomorphic settings of differing ages and attest to the operation of a range of post-depositional geomorphic processes (e.g., burial, washover, deflation);

Available archaeological data suggest that the Inter-barrier Depression was a focal resource zone for Aboriginal people occupying the Inner and Outer Barriers throughout the mid-to-late Holocene. However, Aboriginal archaeological sites are unlikely to occur within this geomorphic environment due to unfavourable occupation conditions;

Previous archaeological investigations within the Inner and Outer Barrier sand masses have identified low elevation, low gradient dune surfaces overlooking the Inter-barrier Depression and freshwater swamps as being of high archaeological sensitivity, with the largest and most complex archaeological sites occurring in these contexts. These landforms are absent from the Study area;

Shell middens/scatters with and without associated flaked stone artefacts and other cultural materials/features are the most common site type on a regional scale, with open artefact sites comprising the majority of sites on a local scale; and

Mid-to-late Holocene flaked stone assemblages from the region attest to the use of a variety of raw materials for flaked stone tool manufacture. However, fine-grained volcanic tuffs, often grey or cream in colour, are typically dominant. These tuffs occur in a variety of Permian era geological formations on the peripheries of the Newcastle Bight embayment and appear to have been sourced from both bedrock outcrops and alluvial gravel deposit.

5.0 Historical Heritage

5.1 Heritage Register Searches

Searches of relevant heritage registers and lists were undertaken on 16 November 2020 to identify previously recorded historical heritage items within and in proximity to the Study area. No heritage listed items were identified within the Study area. Heritage listed items located within 500 m of the Study area are shown in Table 4.

There are no anticipated impacts to any historic heritage listed items for the Project.

Table 4. Heritage Listed Items within 500 m of the Study area

Heritage list	(ID) Item	Significance	Distance from Study area
World Heritage List	Nil	n/a	n/a
National Heritage List	Nil	n/a	n/a
Commonwealth Heritage List	(105639) Williamtown RAAF Base Group	Commonwealth	400 m[3]
Register of the National Estate (non-statutory)	(102730) Williamtown RAAF Base Group	Listed	400 m
State Heritage Register	Nil	n/a	n/a
S170 Heritage and Conservation Registers	Nil	n/a	n/a
Port Stephens LEP 2013	(I109) Devon House	Local	420 m

5.2 HMP 2008

The curtilage of RAAF Base Williamtown, as represented in the 2008 HMP, encompasses the entirety of Defence-owned land and includes areas outside the CHL listed curtilage for the Base. The heritage values of the Base have been assessed within the HMP and four zones of cultural heritage management have been designated (refer to Figure 3) (Woodhead International, 2008:40-42).

Historical heritage values have been identified within Zone 1 –Base Core, and Zone 3 – Runway. The portion of the Study area located within land covered under the 2008 HMP is designated as Zone 4 – RAAF Base Williamtown Free Area. No historical heritage values have been identified within this area.

[3] It should be noted that the CHL listed curtilage of the RAAF Base Williamtown does not align with the curtilage identified in the 2008 HMP. Refer to Section 5.2 for details on historic heritage values identified within the 2008 HMP.

Figure 7 Heritage listings within 100 m of the Study area

6.0 Visual Inspection

A visual inspection of the Study area was undertaken by AECOM Archaeologist Julia Atkinson on 23 November 2020. The primary aim of the inspection was to identify and record levels of previous disturbance and any existing surface evidence of past-Aboriginal activity and / or historic heritage relics within the Study area.

All outside areas across the Study area were traversed where access was not restricted by security fences. Due to Defence regulations, photography was not permitted during the inspection.

The following key observations were made during the site inspection:

- Areas inspected largely comprised asphaltic-paved or concreted hardstand, existing BAE facility and utility buildings, and raised garden beds fringing the facility buildings and carparks;
- Areas of grassland were observed in the north western portion of the Study area across a former helicopter landing area and in small sections of easement corridors running roughly north-south and east-west along the south western and southern sections of the BAE site, respectively. In these areas, Ground Surface Visibility (GSV) ranged from 0 – 70%, with exposures revealing sandy soils mixed with pebbles and areas of fill in parts;
- In addition to the existing buildings and paved areas, areas of disturbance associated with subsurface drains and utilities and introduced fill were identified within the site;
- No Aboriginal objects / sites were identified during the visual inspection;
- No areas of Aboriginal archaeological sensitivity were identified within the Study area;
- No historic relics or sites were identified during the visual inspection; and
- No areas of historical archaeological sensitivity were identified within the Study area.

7.0 Preliminary Impact Assessment

7.1 Application of Due Diligence Code of Practice to the Project

DPC's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW 2010* (DECCW, 2010c) provides a series of questions to assist a proponent in determining whether their proposed activity is likely to harm Aboriginal objects and, by extension, the requirement for further investigation / impact assessment and an AHIP application under Section 90 of the NPW Act. In Table 5, the relevant questions posed by the Code of Practice are applied to the proposed activity and Study area. Should the answer to Question 4 be 'yes', further investigation and impact assessment would be required. The NPW Regulation removes the need to follow the due diligence process if you are carrying out a specifically defined 'low impact activity'. Low impact activities are listed in Clause 80B of the regulation. A review of Clause 80B indicates that the proposed activity does not comprise a low impact activity under the NPW Regulation. Accordingly, the due diligence process stipulated by the *Due Diligence Code of Practice* must be adhered to.

Table 5. Due Diligence Process Questions

Question	Answer	Reasoning
Will the activity disturb the ground surface or any culturally modified trees?	Yes / No	The Project is likely to require ground surface disturbance within the Study area; however, these impacts are predominately to be located in areas previously subject to high levels of disturbance. The depth of the proposed impacts is also likely to be minor due to the requirement to avoid disturbing contaminated land. The Project is not anticipated to disturb any Aboriginal sites, including modified trees, as verified during the visual inspection.
Are there any relevant confirmed site records or other associated landscape feature information on AHIMS?	No	The AHIMS database holds no records of known Aboriginal sites located within 100 metres of the Study area. Searches of the AHIMS database and reference to the relevant site card recordings confirmed that the nearest site (AHIMS Site # 38-4-1146) is located approximately 125 metres south-east of the Study area.
Are there any other sources of information of which a person is already aware?	No	AECOM has reviewed all available literature and pertinent sources of information pertaining to the known Aboriginal resource of the Study area and surrounds.
Are there any landscape features that are likely to indicate the presence of Aboriginal objects?	No	Available evidence suggests that the potential for extant Aboriginal sites to be present in surface or subsurface contexts across the Study area is low. Most pertinent to the current investigation, the existing BAE facilities and paved surfaces of the NAPL site are dominant elements of the Study area and their construction would likely have removed any surface and / or subsurface archaeological potential from the Study area. Existing archaeological data indicates that proximity to watercourses is a key variable in the location of Aboriginal archaeological (with sites often found within 200 m of watercourses). No natural water sources are located within the vicinity of the Study area. Additionally, sites in the local landscape are generally restricted to elevated terrace landforms and remnant stable sand dunes. Low-lying environs such as in this instance, are unlikely to have supported campsites or the preservation of artefacts.
Can harm to Aboriginal objects listed on AHIMS or	Yes	The Project is not anticipated to harm any Aboriginal objects. This assessment has identified that there are no

Question	Answer	Reasoning
identified by other sources of information and / or can the carrying out of the activity at the relevant landscape features be avoided?		known sites within the Study area and previously unidentified extant Aboriginal archaeological evidence is unlikely to be present within the site.
Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?	No	This assessment has identified that the Study area is unlikely to contain extant Aboriginal archaeological objects or sites, due to the high levels of historic disturbance observed and documented across the site and the unsuitability of the landscape for past Aboriginal occupation.

7.2 Conclusions

This assessment has determined that there are no identified Aboriginal or historical heritage constraints applicable to the Project located within the Study area. There are no registered Aboriginal or historical sites or relics located within the Study area and both the landform and high levels of previous disturbance documented and observed across the Study area render the potential for unknown and/or subsurface artefacts unlikely.

8.0 Management Recommendations

In light of the Due Diligence Process Questions and conclusions presented above, this preliminary combined Aboriginal Archaeological Due Diligence and Historical Heritage Assessment provides the following management recommendations:

The Study area has been assessed as being located in an area of low Aboriginal archaeological sensitivity, due both to the low-lying landform itself and high levels of past disturbance. No Aboriginal archaeological constraints are associated with the Study area;

In the unlikely event that Aboriginal objects or historical relics, including possible human skeletal remains, are identified during the proposed works, all works in the area must cease immediately and the procedures outlined in Appendix C of this report should be followed as applicable to the area of discovery[4]. The stop works procedure should be included within the Project's construction management plan

[4] AECOM acknowledges that part of the Study area falls under the management schedules of the RAAF Base Williamtown HMP, which contain mitigation measures for 'unforeseen discoveries' outlined in Section 3.3.7 of the HMP. However, AECOM recommends that standard State-based procedures for managing unexpected Aboriginal and historical heritage discoveries be implemented as best practice.

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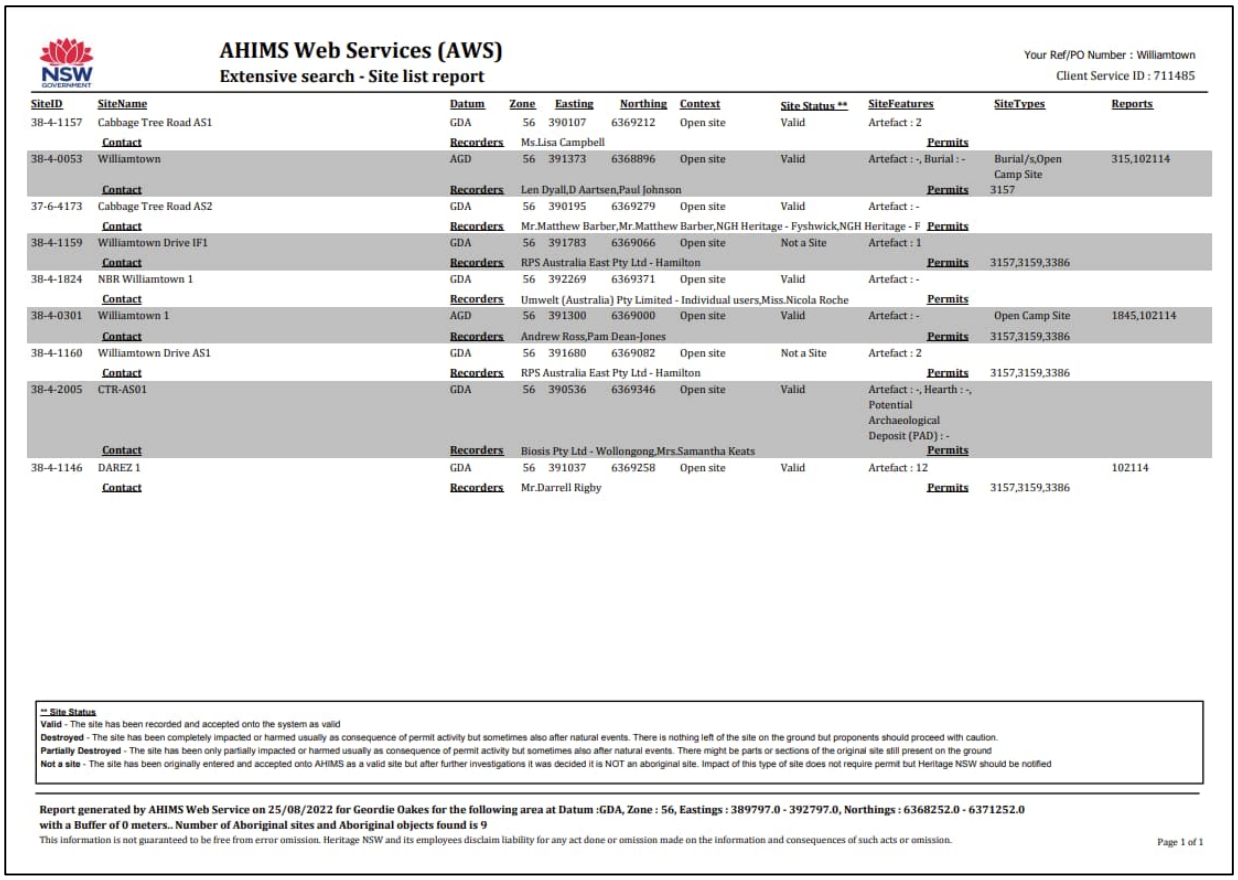
Appendix A – AHIMS Search Results



AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : Williamtown
Client Service ID : 711485

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
38-4-1157	Cabbage Tree Road AS1	GDA	56	390107	6369212	Open site	Valid	Artefact : 2		
	Contact	**Recorders**	Ms.Lisa Campbell					**Permits**		
38-4-0053	Williamtown	AGD	56	391373	6368896	Open site	Valid	Artefact : -, Burial : -	Burial/s,Open Camp Site	315,102114
	Contact	**Recorders**	Len Dyall,D Aartsen,Paul Johnson					**Permits**	3157	
37-6-4173	Cabbage Tree Road AS2	GDA	56	390195	6369279	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Matthew Barber,Mr.Matthew Barber,NGH Heritage - Fyshwick,NGH Heritage - F					**Permits**		
38-4-1159	Williamtown Drive IF1	GDA	56	391783	6369066	Open site	Not a Site	Artefact : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**	3157,3159,3386	
38-4-1824	NBR Williamtown 1	GDA	56	392269	6369371	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Umwelt (Australia) Pty Limited - Individual users,Miss.Nicola Roche					**Permits**		
38-4-0301	Williamtown 1	AGD	56	391300	6369000	Open site	Valid	Artefact : -	Open Camp Site	1845,102114
	Contact	**Recorders**	Andrew Ross,Pam Dean-Jones					**Permits**	3157,3159,3386	
38-4-1160	Williamtown Drive AS1	GDA	56	391680	6369082	Open site	Not a Site	Artefact : 2		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**	3157,3159,3386	
38-4-2005	CTR-AS01	GDA	56	390536	6369346	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats					**Permits**		
38-4-1146	DAREZ 1	GDA	56	391037	6369258	Open site	Valid	Artefact : 12		102114
	Contact	**Recorders**	Mr.Darrell Rigby					**Permits**	3157,3159,3386	

**** Site Status**
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 25/08/2022 for Geordie Oakes for the following area at Datum :GDA, Zone : 56, Eastings : 389797.0 - 392797.0, Northings : 6368252.0 - 6371252.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 9

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

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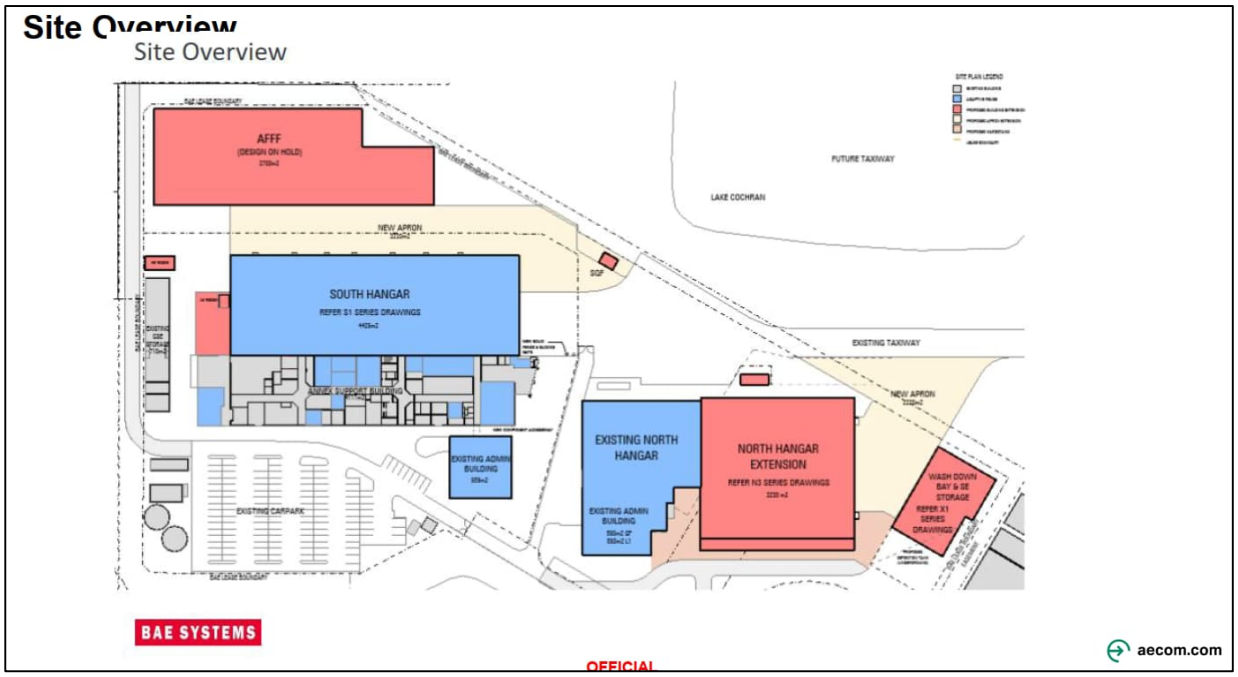
Appendix B – Design Plans



Appendix C – Management of Unexpected Finds

Management of Previously Unrecorded Aboriginal Objects

Should a suspected Aboriginal site be identified at any point throughout the life of the proposed works, the following standard procedure should be adopted:

1. All works must cease immediately in the area to prevent any further impacts to the site;
2. Notify the project manager;
3. Engage a suitably qualified heritage consultant to determine the nature, extent and significance of the find and provide appropriate management advice. Management action(s) will vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts;
4. Record the site and prepare and submit an AHIMS site card for the site.

Human Skeletal Remains

In the event that potential human skeletal remains are identified at any point during the life of the Project, the following standard procedure (New South Wales Police Force, 2015; NSW Health, 2013) should be followed:

1. All work in the vicinity of the remains should cease immediately;
2. The location should be cordoned off and the NSW Police notified; and
3. If the Police suspect the remains are Aboriginal, they will contact Heritage NSW to arrange for a forensic anthropologist or archaeological expert to examine the site.

Subsequent management actions will be dependent on the findings of the inspection, but may include:

- If the remains are identified as modern and human, the area will become a crime scene under the jurisdiction of the NSW Police;
- If the remains are identified as pre-contact or historic Aboriginal, Heritage NSW and all relevant Aboriginal stakeholders are to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy will be developed in consultation with Heritage NSW and Aboriginal stakeholders;
- If the remains are identified as historic non-Aboriginal, the site is to be secured and Heritage NSW contacted; and / or
- If the remains are identified as non-human, work can recommence immediately.

Management of Previously Unrecorded Historical Relics

In the event that unexpected military or other historical relics are identified during the life of the proposed works, the following procedure should be adopted:

1. All works must cease immediately in the area to prevent any further impacts to the site;
2. Notify the project manager; and
3. Engage a suitably qualified heritage consultant to determine the nature, extent and significance of the find and provide appropriate management advice. Management action(s) will vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.

If required, notify Heritage NSW by submitting a Section 146 Notification of a Relic form.