ERM

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# Williamtown SAP Structure Plan Indigenous Heritage

## LGA: Port Stephens

## Aboriginal Cultural Heritage and Archaeological Desk Top Assessment

## [Public Display Version]

**23 January 2023**

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| Report No: J20091 ACHA | |
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| Approved by: | Penny McCardle |
| Position: | Director |
| Signed: |  |
| Date: | 23 January 2023 |

## Acknowledgement to Country

MCH wish to acknowledge the custodians of this land, the Worimi people and their Elders past and present and future. We acknowledge and respect their continuing culture and the contribution they make to the life of this city and this region.

We recognise and respect their cultural heritage, beliefs and relationship with the land, which continue to be important to the Worimi people living today and recognise the strength, resilience and capacity of Worimi people in this land.

We acknowledge the First Australians as the traditional custodians of the continent, whose cultures are among the oldest living cultures in human history.

We would like to thank the Worimi who have given us the privilege of working together, sharing knowledge and experiences that have intertwined to build stronger relationships and understanding.

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## EXECUTIVE SUMMARY

McCardle Cultural Heritage Pty Ltd (MCH) was engaged by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of the NSW Government to prepare an abbreviated Aboriginal Cultural Heritage Assessment (ACHA) for the proposed Williamtown Special Activation Precinct (SAP). It has been designed to assess the Aboriginal heritage potential of the SAP, as based on the Structure Plan (SAP boundary). The Structure Plan was developed from a series of Enquiry by Design Workshops and this assessment aims to establish the relevant specifications and requirements to assist in the implementation of the Structure Plan.

Due to the nature of the assessment, no field work had been undertaken at this stage of the process and this ACHA EXCLUDES a significance assessment and impact assessment. It is recommended that a significance assessment and preliminary impact assessment be developed from survey and further consultation as part of an ACHA to support future Development Applications, where required an updated assessment would be developed to incorporate the results of subsurface investigations.

The Williamtown SAP boundary is located within the lands of the Worimi people. The registered Aboriginal Stakeholders include Worimi LALAC, Mur-Roo-Ma Inc, Nur-Rn-Gee Pty Ltd and Karuah Indigenous Corporation.

The geomorphology of the area is complex and the SAP boundary consists predominantly of the interbarrier depression (previously a lagoon) with dunes to the north overlooking the interbarrier depression, which are locations favoured by past Aboriginal people for camping due to the abundance of resources. In terms of water and resource availability, the SAP boundary includes the resource rich inter-barrier depression or swamp (previous lagoon/estuary). The area was very well resourced in terms of fresh water and associated resources as well as marine resources. The interbarrier depression was clearly favoured for hunting and gathering with little to no evidence of past Aboriginal land uses, with the elevated dunes overlooking the interbarrier depression and the beach areas having being favoured for camping in close proximity to these resources.

A search of the AHIMS register has shown that six known Aboriginal sites are currently recorded within one kilometre of the SAP boundary. This excludes sites identified within the RAAF Base (Commonwealth) land as there is no legislative requirement for sites on Commonwealth land to be registered on AHIMS. A number of previous investigations within the SAP boundary have identified archaeological sites as follows:

- 38-4-1157 (artefact scatter): located on the crest of a stabilised dune system and adjacent to the interbarrier depression, this site consisted of three stone artefacts (one tuff flake, one tuff flake piece and one tuff core).
- 37-6-4173 artefact site.
- 38-4-2005 artefact site with a hearth and a potential archaeological deposit.
- 38-4-1146 artefact site: The AHIMS site card is not available, however, the AHIMS data sheet state that this is an artefact site.
- 38-4-0301 shell midden with artefacts: located on the crest and upper slopes of a Pleistocene transgressive dune (exposure 100m x 60m) with over 1000 visible artefacts eroding downslope and in situ. Artefacts included backed artefacts and blades and there was a very low density of shell along the dune crest (pipi).
- 38-4-0053 shell midden with artefacts and skeletal remains: Recorded by Dyall in 1975, the AHIMS site card first records the presence of shell eroding form the top of a spoil pits that was dug out around 1942 for the construction of the air base runways. Oyster and mud

whelk and stone artefacts of various raw materials were recovered. Additional artefacts were also recovered in 1975. The site card also included information regarding an Aboriginal skull being identified and transferred to Glebe Forensic Medicine. The original location of the skull was unknown and the area had since been totally cleared, levelled and transformed into a grassed area for management purposes (works complete in 1979).

- 38-4-1824 is located outside the SAP boundary across Nelson Bay Road and is an artefact site.

Based on a review of the previous assessments throughout the region and supported by the AHIMS results, the following archaeological patterns have been reported and are considered within this assessment:

- sites are generally within 50 metres of reliable water;
- sites are located on both the Holocene and Pleistocene dunes overlooking the interbarrier depression;
- sites are not usually found in the interbarrier depression;
- there is a decrease in site numbers and site densities between the Inner Holocene dunes and the beach front;
- site types are typically shell middens with various shell species, stone tools and may also contain charcoal, fish and animal bone;
- artefact scatters, isolated finds, scarred trees, burials and ceremonial sites may also be found along the dunes;
- artefacts typically date to the Holocene but Pleistocene sites may be present in the Pleistocene dues;
- raw materials are tuff obtained locally and/or silcrete, chert or quartz that have been traded/transported from the Hunter Valley area; and
- stone artefacts are typically flakes, flake pieces, broken flakes, cores and tools with fish hooks manufactured form local shell.

Within the SAP boundary, AHIMS sites have been identified within the Inner Barrier Dune system, all in close proximity to the interbarrier depression, or swamp lands. Based on the AHIMS sites, past research undertaken throughout the region and locally, as well as the geomorphological studies and traditional knowledge within the SAP boundary, locations of high cultural and archaeological potential have been identified. These are located within the northern portion of the SAP boundary that overlooks the swamp lands (inter barrier depression) and includes the interfaces of the swamp lands and dune. A number of site types are likely to occur including shell middens, artefact scatters, isolated finds, scat trees, camp sites (with middens, artefacts, evidence of cooking and food preperation, knapping etc) and burials. Previous assessments and traditional knowledge have also identified that burials are located throughout the dunal system, and as one has been previously identified within the SAP boundary, there is a very high potential for additional burials to be located in the dunes in the Precinct.

In light of the contextual information, AHIMS results, traditional knowledge and project requirements, the following recommendations are provided, noting that some of the recommendations are beyond the master planning phase and will form part of the early works or delivery phases:

1) An Aboriginal Cultural Heritage Assessment (ACHA) of the Williamtown SAP with a significance assessment and preliminary impact assessment should be undertaken as part of any future development application as follows:

    a) Field surveys of the whole SAP boundary in the first instance to ground truth known AHIMS sites and identify any new sites and PADs. This would produce an ACHA and be undertaken as per the Heritage NSW- Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b);

2) AHIMS sites 38-4-1146, 38-4-1157, 38-4-2005, 38-4-0301, 37-6-4173 and 38-4-0053, will require ground truthing, re-assessment and re-recording to enable the determination of appropriate mitigation measures for these sites.

3) Where survey identifies areas of PAD, updated Aboriginal Cultural Heritage Assessment (ACHA) of the Williamtown SAP with a more detailed significance assessment and impact assessment should be undertaken as part of future development applications as follows:

    a) Test excavations in the development area, as identified through the field surveys. This would be conducted in accordance with the Heritage NSW - Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and will be incorporated into the ACHA as an addendum.

    These ACHAs would include the desk top assessment (environmental, cultural and archaeological contexts), the results of further investigations, significance assessment, impact assessment, identify potential conservation, mitigation and management measures.

4) The requirement for an Aboriginal Cultural Heritage Management Plan (ACHMP) should be a condition of the Development Approval. This plan will be developed to manage Aboriginal Cultural Heritage within the SAP boundary and developed in full consultation with the RAPs, DPE, archaeologist and Heritage NSW. It should include the following requirements:

    a) The persons responsible for the management of onsite works will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974.

    b) The involvement of the registered Aboriginal stakeholders in the ongoing management of the Aboriginal cultural materials within the project study will be promoted and included in the ACHMP.

    c) A cultural awareness program will be included as part of the site induction program and developed with the registered Aboriginal stakeholders and form part of the ACHMP and the site induction for all workers on site.

d) Should a site or place be identified that required conservation/protection, this will be managed in an appropriate manner in full consultation with the RAPs, DPE, project archaeologist and Heritage NSW.

5) Salvage excavations/community collection in the staged or early works approval areas would follow the survey and test excavations (if required) of the approvals process. These would be conducted in accordance with the ACHMP and with the Heritage NSW - Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b). Salvaged Aboriginal heritage material should be relocated to the existing Keeping Place near the Newcastle Airport.

## GLOSSARY

**Aboriginal Cultural Heritage Values**: traditional values of Aboriginal people, handed down in spiritual beliefs, stories and community practices and may include local plant and animal species, places that are important and ways of showing respect for other people.

**Aboriginal Place**: are locations that have been recognised by the Minister for Climate Change and the Environment (and gazetted under the *National Parks and Wildlife Act 1974*) as having special cultural significance to the Aboriginal community. An Aboriginal Place may or may not include archaeological materials.

**Aboriginal Site:** an Aboriginal site is the location of one or more Aboriginal archaeological objects, including flaked stone artefacts, midden shell, grinding grooves, archaeological deposits, scarred trees etc.

**Artefact:** any object that is physically modified by humans.

**Assemblage:** a collection of artefacts associated by a particular place or time, assumed generated by a single group of people, and can comprise different artefact types.

**Axe:** a stone-headed axe usually having two ground surfaces that meet at a bevel.

**Backed artefact:** a stone tool where the margin of a flake is retouched at a steep angle and that margin is opposite a sharp edge.

**Background scatter:** a term used to describe low density scatter of isolated finds that are distributed across the landscape without any obvious focal point.

**Blade:** a flake that is at least twice as long as it is wide.

**Bondi point:** a small asymmetrical backed artefact with a point at one end and backing retouch.

**Core:** a chunk of stone from which flakes are removed and will have one or more negative flake scars but no positive flake scars. The core itself can be shaped into a tool or used as a source of flakes to be formed into tools.

**Debitage:** small pieces of stone debris that break off during the manufacturing of stone tools. These are usually considered waste and are the by-product of production (also referred to as flake piece).

**Flake:** any piece of stone struck off a core and has a number of characteristics including ring cracks showing where the hammer hit the core and a bulb of percussion. May be used as a tool with no further working, may be retouched or serve as a platform for further reduction.

**Flaked piece/waste flake:** an unmodified and unused flake, usually the by-product of tool manufacture or core preparation (also referred to as debitage).

**Formation processes:** human caused (land uses etc) or natural processes (geological, animal, plant growth etc) by which an archaeological site is modified during or after occupation and abandonment. These processes have a large effect on the provenience of artefacts or features.

**Grinding stone:** an abrasive stone used to abrade another artefact or to process food.

**Hammer stone:** a stone that has been used to strike a core to remove a flake, often causing pitting or other wear on the stone's surface.

**Harm:** is defined as an act that may destroy, deface or damage an Aboriginal object or place. In relation to an object, this means the movement or removal of an object from the land in which it has been situated

**Holocene:** the post-glacial period, beginning about 10,000 B.P.

**In situ:** archaeological items are said to be "in situ" when they are found in the location where they were last deposited.

**Pleistocene:** the latest major geological epoch, colloquially known as the "Ice Age" due to the multiple expansion and retreat of glaciers. Ca. 3.000, 000-10,000 years B.P.

**Retouched flake:** a flake that has been flaked again in a manner that modified the edge for the purpose of resharpening that edge.

**Stratified Archaeological Deposits**: Aboriginal archaeological objects may be observed in soil deposits and within rock shelters or caves. Where layers can be detected within the soil or sediments, which are attributable to separate depositional events in the past, the deposit is said to be stratified. The integrity of sediments and soils are usually affected by 200 years of European settlement and activities such as land clearing, cultivation and construction of industrial, commercial and residential developments.

**Taphonomy:** the study of processes which have affected organic materials such as bone after death; it also involves the microscopic analysis of tooth-marks or cut marks to assess the effects of butchery or scavenging activities.

**Traditional Aboriginal Owners**: Aboriginal people who are listed in the Register of Aboriginal owners pursuant to Division 3 of the *Aboriginal Land Register Act (1983)*. The Registrar must give priority to registering Aboriginal people for lands listed in Schedule 14 of the *National Parks and Wildlife Act 1974* or land subject to a claim under 36A of the *Aboriginal Land Rights Act 1983*.

**Traditional Knowledge**: Information about the roles, responsibilities and practices set out in the cultural beliefs of the Aboriginal community. Only certain individuals have traditional knowledge and different aspects of traditional knowledge may be known by different people, e.g. information about men's initiation sites and practices, women's sites, special pathways, proper responsibilities of people fishing or gathering food for the community, ways of sharing and looking after others, etc.

**Typology:** the systematic organization of artefacts into types on the basis of shared attributes.

**Use wear:** the wear displayed on an artefact as a result of use.

## ACRONYMS

| | |
|---|---|
| **ACHMP** | Aboriginal Cultural Heritage Management Plan |
| **AHIMS** | Aboriginal Heritage Information Management System |
| **AHIP** | Aboriginal Heritage Impact Permit |
| **DAREZ** | Defence and Aerospace Related Employment Zone |
| **DECCW** | Department of Environment of Environment, Climate Change and Water (now Heritage NSW) |
| **DPE** | Department of Planning and Environment |
| **OEH** | Office of Environment and Heritage (now Heritage NSW) |

## AHIMS SITE ACRONYMS

| | |
|---|---|
| **ACD** | Aboriginal ceremonial and dreaming |
| **AFT** | Artefact (stone, bone, shell, glass, ceramic and metal) |
| **ARG** | Aboriginal resource and gathering |
| **ART** | Art (pigment or engraving) |
| **BOM** | Non-human bone and organic material |
| **BUR** | Burial |
| **CFT** | Conflict site |
| **CMR** | Ceremonial ring (stone or earth) |
| **ETM** | Earth mound |
| **FSH** | Fish trap |
| **GDG** | Grinding groove |
| **HAB** | Habitation structure |
| **HTH** | Hearth |
| **OCQ** | Ochre quarry |
| **PAD** | Potential archaeological Deposit. Used to define an area of the landscape that is believed to contain subsurface archaeological deposits. |
| **SHL** | Shell |
| **STA** | Stone arrangement |
| **STQ** | Stone quarry |
| **TRE** | Modified tree (carved or scarred) |
| **WTR** | Water hole |

# 1 INTRODUCTION

McCardle Cultural Heritage Pty Ltd (MCH) was engaged by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of the NSW Government to prepare an abbreviated Aboriginal Cultural Heritage Assessment (ACHA) for the proposed Williamtown Special Activation Precinct (SAP). Due to the nature of the assessment, no field work had been undertaken and this ACHA excludes a significance assessment and impact assessment.

The assessment has been undertaken to meet the Heritage NSW, Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and the brief.

## 1.1 PROJECT BACKGROUND

Funded by the Snowy Hydro Legacy Fund, an SAP is a dedicated area in regional NSW identified by the NSW Government as places where business will thrive. They will create jobs, attract investors and fuel development. The SAP catchments will support industries in line with the competitive advantages and economic strengths of each area. An SAP in Williamtown will help to create a defence and aerospace hub, boost the local economy and generate thousands of new jobs for the region.

The new Williamtown SAP will build on the NSW Government's existing investment into the Astra Aerolab and create highly-skilled, long-term job opportunities that will attract investors, and strengthen the region's economy. The SAP planning process will deliver coordinated and precinct-wide approach to addressing historical land constraints including flooding and drainage, which have acted as a barrier to development in the past.

The new State Environmental Planning Policy – Precincts-Regional SEPP and the Structure Plan will replace existing planning instruments. It will provide for environmental protection and performance, land uses and planning pathways. The goal is to undertake upfront assessment at a strategic level so industry and the community have certainty and clarity about what types of land uses and development can occur where. The Structure Plan was initially placed on public exhibition between April and June 2022. Subsequent to this phase the SAP boundary was reduced. As a consequence of this reduction and the resulting design changes associated with the reduced boundary it is proposed that the masterplan and associated technical papers will undergo an additional round of public exhibition in early 2023.

## 1.2 PROPONENT DETAILS

NSW Government.

## 1.3 THE STRUCTURE PLAN

The NSW Department of Planning and Environment (DPE) is responsible for preparing the planning framework for each SAP.

Following a series of Enquiry by Design Workshops, the Structure Plan and catchment strategy was developed based on the results, opportunities and constraints of all the various disciplines, including, but not limited to ecology, archaeology, air quality, noise, heritage, hydrology, transport, bushfire, planning, civil engineering, urban design and soil.

In order to fully understand the inter-relationships between the landscape and Aboriginal people, their beliefs, land uses, site selection, natural resource utilisation (and many other interactions with the land) and how that manifest in the archaeological record, the wider landscape must be considered as a whole. For this reason, this report provides a landscape-level approach to management in order to ensure that the intrinsic links between cultural heritage and the landscape are recognised, the wider environmental, cultural and archaeological contexts discussed and then focuses on the SAP boundary. The location and extent of the SAP boundary and the focus of this report is illustrated in Figures 1.1 to 1.2.

Figure 1.1 Regional location of Williamtown SAP (ERM 2022)

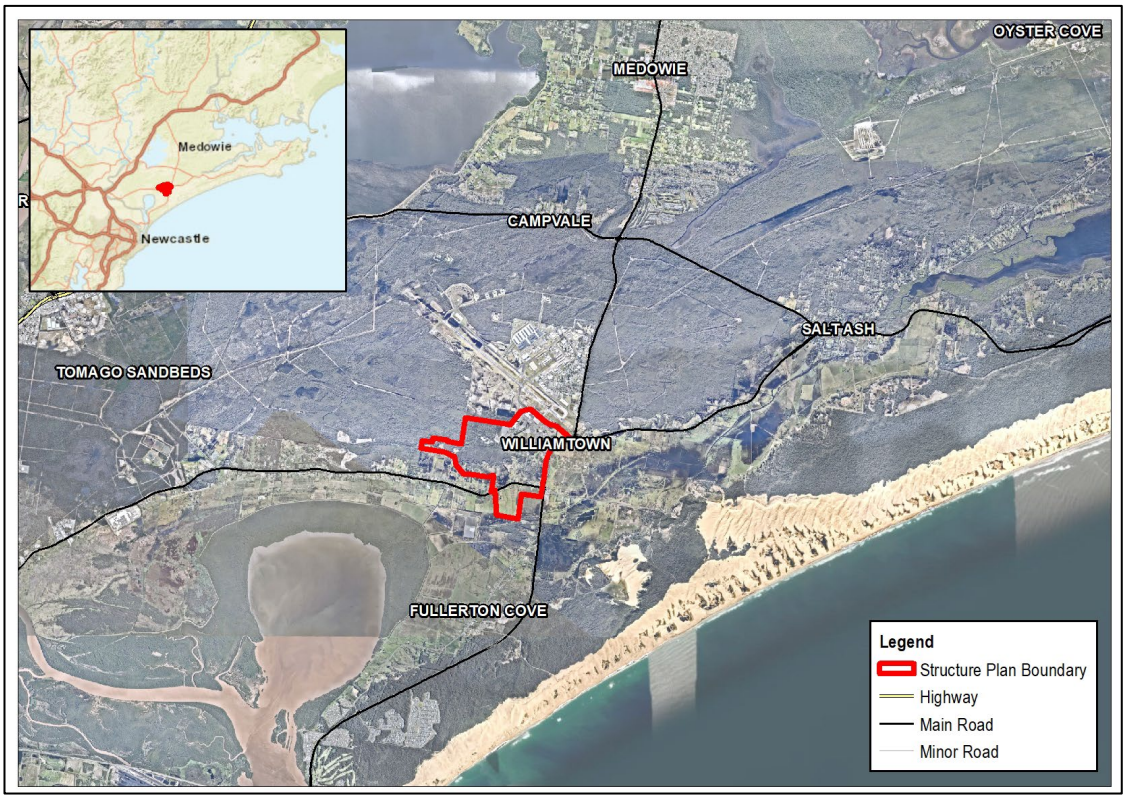
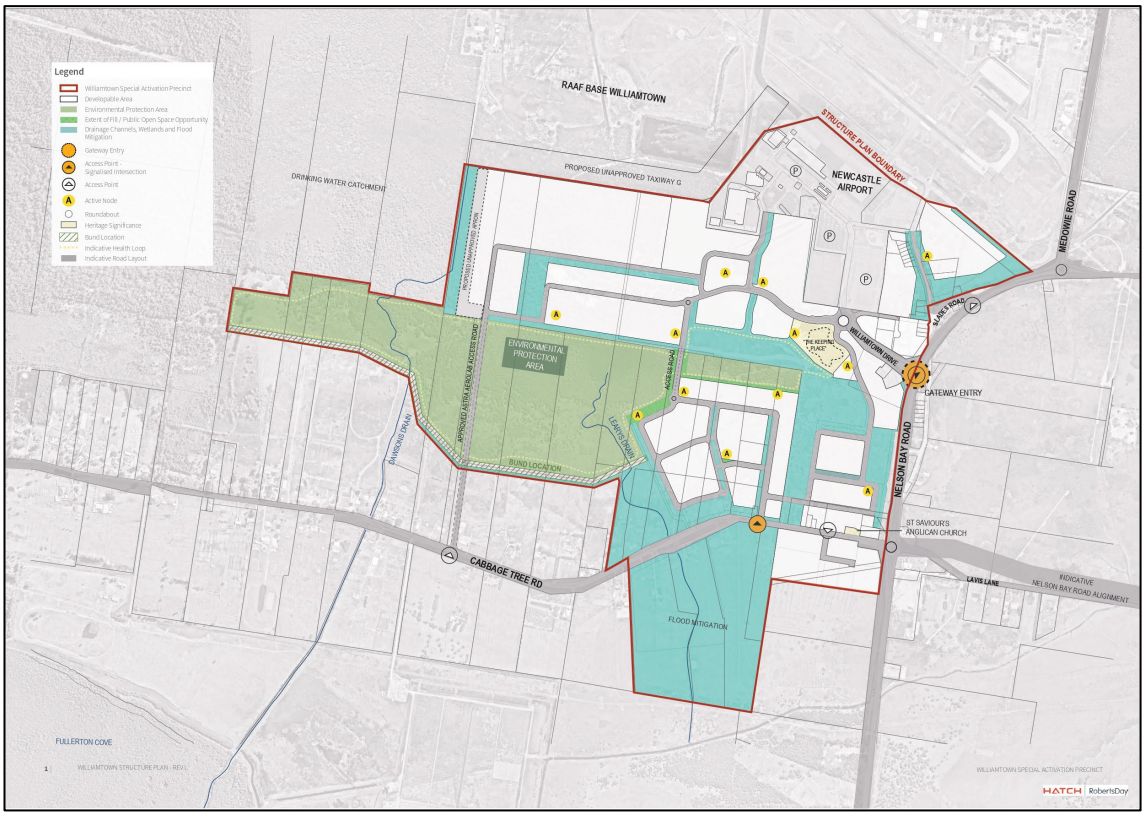


Figure 1.2 Structure Plan (DPE 2022)



## 1.4 PURPOSE OF THE ARCHAEOLOGICAL ASSESSMENT

The purpose of the assessment is to assess any archaeological constraints to support the Williamtown SAP and to provide opportunities and options to ensure any cultural materials present are protected in an appropriate manner.

## 1.5 OBJECTIVE OF THE ASSESSMENT

The objective of the assessment is to identify areas of known or potential Indigenous cultural heritage value and to develop preliminary management recommendations in the development and implementation of the Structure Plan. The assessment employs a regional approach, taking into consideration both the landscape (landforms, water resources, soils, geology etc.) and the regional archaeological patterning identified by past studies.

## 1.6 PROJECT BRIEF/SCOPE OF WORK

The following tasks were carried out:

- a review of relevant statutory registers and inventories for Indigenous cultural heritage including Heritage NSW Aboriginal Heritage Information Management System (AHIMS) for known archaeological sites, the State Heritage Register, the Australian Heritage Database (includes data from the World Heritage List UNESCO, National Heritage List, Commonwealth Heritage List, Register of the National Estate) and the Port Stephens Local Environmental Plan;
- a review of local environmental information (topographic, geological, soil, geomorphological and vegetation descriptions) to determine the likelihood of archaeological sites and specific site types, prior and existing land uses and site disturbance that may affect site integrity;
- a review of previous cultural heritage investigations to determine the extent of archaeological investigations in the area and any archaeological patterns;
- the development of a predictive archaeological statement based on the data searches and literature review;
- identification of human and natural impacts in relation to the known and any new archaeological sites archaeological potential within the SAP boundary;
- consultation with the Aboriginal stakeholders as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010); and
- the development of mitigation and conservation measures in consultation with the registered Aboriginal stakeholders.

## 1.7 LEGISLATIVE CONTEXT

The following overview of the legislative framework is provided solely for information purposes for the client and should not be interpreted as legal advice. MCH will not be liable for any actions taken by any person, body or group as a result of this general overview and MCH recommends that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken as a result of the general summary below.

Land managers are required to consider the affects of their activities or proposed development on the environment under several pieces of legislation. Although there are a number of Acts and regulations protecting Aboriginal heritage, including places, sites and objects, within NSW, the three main ones include:

- National Parks and Wildlife Act (1974, as amended)
- National Parks and Wildlife Regulation (2019)
- Environmental Planning and Assessment Act (1979)

### 1.7.1 NATIONAL PARKS AND WILDLIFE ACT (1974, AS AMENDED)

The National Parks and Wildlife Act (1974), Amended 2010, is the primary legislation for the protection of Aboriginal cultural heritage in New South Wales. The NPW Act protects Aboriginal heritage (places, sites and objects) within NSW and the Protection of Aboriginal heritage is outlined in s86 of the Act, as follows:

- "A person must not harm or desecrate an object that the person knows is an Aboriginal object" s86(1)
- "A person must not harm an Aboriginal object" s86(2)
- "A person must not harm or desecrate an Aboriginal place" s86(4)

Penalties apply for harming an Aboriginal object, site or place. The penalty for knowingly harming an Aboriginal object (s86[1]) and/or an Aboriginal place (s86[4]) is up to $550,000 for an individual and/or imprisonment for 2 years; and in the case of a corporation the penalty is up to $1.1 million. The penalty for a strict liability offence (s86[2]) is up to $110,000 for an individual and $220,000 for a corporation.

Harm under the National Parks and Wildlife Act (1974, as amended) is defined as any act that; destroys defaces or damages the object, moves the object from the land on which it has been situated, causes or permits the object to be harmed. However, it is a defence from prosecution if the proponent can demonstrate that;

1) harm was authorised under an Aboriginal Heritage Impact Permit (AHIP) (and the permit was properly followed), or
2) the proponent exercised due diligence in respect to Aboriginal heritage.

The 'due diligence' defence (s87[2]), states that if a person or company has applied due diligence to determine that no Aboriginal object, site or place was likely to be harmed as a result of the activities proposed for the Project Area, then liability from prosecution under the NPW Act 1974 will be removed or mitigated if it later transpires that an Aboriginal object, site or place was harmed. If any Aboriginal objects are identified during the activity, then works should cease in that area and OEH notified (DECCW 2010:13). The due diligence defence does not authorise continuing harm.

The archaeological due diligence assessment and report has been carried out in compliance with the NSW DECCW 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW.

### 1.7.2 NATIONAL PARKS AND WILDLIFE REGULATION (2019)

The National Parks and Wildlife Regulation 2019 provides a framework for undertaking activities and exercising due diligence in respect to Aboriginal heritage. The Regulation (2019) recognises various due diligence codes of practice, including the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW which is pertinent to this report, but it also outlines procedures for Aboriginal Heritage Impact Permit (AHIP) applications and Aboriginal Cultural Heritage Consultation Requirements (ACHCRs); amongst other regulatory processes.

### 1.7.3 ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979 (EP&A ACT)

EP&A Act establishes the statutory framework for planning and environmental assessment in NSW and the implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils. The EP&A Act contains three parts which impose requirements for planning approval:

- Part 3 of the EP&A Act relates to the preparation and making of Environmental Planning Instruments (EPIs), State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).
- Part 4 of the EP&A Act establishes the framework for assessing development under an EPI. The consent authority for Part 4 development is generally the local council, however the consent authority may by the Minister, the Planning Assessment Commission or a joint regional planning panel depending upon the nature of the development.
- Part 4, Division 4.1 of the EP&A Act establishes the assessment pathway for State Significant Development (SSD) declared by the State Environmental Planning Policy (State and Regional Development) 2011 (NSW). Once a development is declared as SSD, the Director-General will issue Director-General Requirements (DGRs) outlining what issues must be considered in the EIS.
- Part 5 of the EP&A Act provides for the control of 'activities' that do not require development consent and are undertaken or approved by a determining authority. Development under Part 5 that are likely to significantly affect the environment is required to have an EIS prepared for the proposed activity.
- Part 5.1 of the EP&A Act establishes the assessment pathways for State significant infrastructure (SSI). Development applications made for SSI can only be approved by the Minister. Once a development is declared as SSI, the Director-General will issue DGRs outlining what issues must be addressed in the EIS.

The applicable approval process is determined by reference to the relevant environmental planning instruments and other controls, LEPs and State Environmental Planning Policies (SEPPs).

As noted in Section 1.1, the new State Environmental Planning Policy – Precincts Regional SEPP and the Structure Plan will replace existing planning instruments. It will provide for environmental protection and performance, land uses and planning pathways. The goal is to undertake upfront assessment at a strategic level so industry and the community have certainty and clarity about what types of land uses and development can occur where.

## 1.8 QUALIFICATIONS OF THE INVESTIGATOR

Dr. Penny McCardle: Principal Archaeologist & Forensic Anthropologist has 20 years experience in Indigenous archaeological assessments, excavation, research, reporting, analysis and consultation. Six years in skeletal identification, biological profiling and skeletal trauma identification.

- BA (Archaeology and Palaeoanthropology), University of New England 1999
- Hons (Archaeology and Palaeoanthropology): Physical Anthropology, University of New England 2001
- Forensic Anthropology Course, University of New England 2003
- Armed Forces Institute of Pathology Forensic Anthropology Course, Ashburn, VA 2008
- Analysis of Bone trauma and Pseudo-Trauma in Suspected Violent Death Course, Erie College, Pennsylvania, 2009

- Documenting Scenes of War and Human Rights Violations. Institute for International Criminal Investigations, 2018
- PhD, University of Newcastle, 2019

Ashely McCardle: is a qualified writer and publisher with has 6 years' experience in research, writing and publishing and researched and wrote Section 4 of this report.

- BA (Hons) Creative Writing and Publishing, University of Kingston, England 1999

## 1.9 REPORT STRUCTURE

The report includes Section 1 which outlines the project, Section 2 provides the consultation, Section 3 presents the environmental context, Section 4 presents cultural context, Section 5 the ethno-historic context, Section 6 provides the archaeological background, Section 6 presents the mitigation strategies and Section 7 presents the management recommendations.

# 2 CONSULTATION

As per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (April 2010), MCH followed the four stages of consultation as set out below. All correspondences for each stage are provided in Appendix A.

In relation to cultural significance, MCH recognises and supports the Indigenous system of knowledge. That is, that knowledge is not 'open' in the sense that everyone has access and an equal right to it. Knowledge is not always definitive (in the sense that there is only one right answer) and knowledge is often restricted. As access to this knowledge is power, it must be controlled by people with the appropriate qualifications (usually based on age seniority, but may be based on other factors). Thus, it is important to obtain information from the correct people: those that hold the appropriate knowledge of those sites and/or areas relevant to the project. It is noted that only the Aboriginal community can identify and determine the accepted knowledge holder(s) and these may not be archaeologists or proponents. If knowledge is shared, that information must be used correctly and per the wishes of the knowledge holder.

Whilst an archaeologist may view this information as data, a custodian may view this information as highly sensitive, secret/sacred information and may place restrictions on its use. Thus, it is important for MCH to engage in effective and long-term consultation to ensure knowledge is shared and managed in a suitable manner that will allow for the appropriate management of that site/area. MCH also know that archaeologists do not have the capability nor the right to adjudicate on the spirituality of a particular location or site as this is the exclusive right of the traditional owners who have the cultural and hereditary association with the land of their own ancestors. For these reasons, consultation forms an integral component of all projects and this information is sought form the registered stakeholders to be included in the report in the appropriate manner that is stipulated by those with the information.

## 2.1 STAGE 1: NOTIFICATION & REGISTRATION OF INTEREST

The aim of this stage was to identify, notify and register Aboriginal people and/or groups who hold cultural knowledge that is relevant to the Williamtown SAP, and who can determine the cultural significance of any Aboriginal objects and/or places within the proposed SAP boundary. In order to do this, the sources identified by Heritage NSW (OEH 2010:10) and listed in Table 2.1 were contacted by letter on 27th November 2020. These organisations were requested to provide the names of people who may hold cultural knowledge that is relevant to determining the significance of Aboriginal objects and/or places and it was stipulated that if no response was received, the project and consultation would proceed. Information included in the correspondence to the sources listed in Table 2.1 included the name and contact details of the proponent, an overview of the proposed project including the location, and a map showing the location.

Table 2.1 Sources contacted

| Organisations contacted | Response |
|---|---|
| Heritage NSW | 27 groups |
| Worimi LALC | 2 groups |
| Port Stephens Council | 5 groups |
| Registrar Aboriginal Land Rights Act 1983 | no response |
| National Native Title Tribunal | no claims |
| Native Title Services Corporation Limited | no response |
| Hunter Local Land Services | no response |

Following this, MCH compiled a list of people/groups to contact (Refer to Annex A). As per the Aboriginal cultural heritage consultation requirements for proponents (April 2010), archaeologists and proponents must write to all those groups identified asking if they would like to register their interest in the project. Unfortunately, some Government departments that must be consulted do not differentiate groups from different traditional boundaries and provide an exhaustive list of groups from across the region including those outside their traditional boundaries.

An advertisement was placed in the Port Stephens Examiner and MCH wrote to all parties identified by the various departments on 10th December 2020. The correspondence and advertisement included the required information as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (April 2010) and requested respondents to nominate the preferred option for the presentation of information about the proposed project: an information packet or a meeting and information packet (Refer to Stage 2). The Registered Aboriginal Parties (RAPs) are listed in Table 2.2.

Table 2.2 Registered Aboriginal Parties

| RAP | Contact |
|---|---|
| Worimi LALC | Jamie Merrick |
| Mur-Roo-Ma Inc. | Anthony Anderson |
| Nur-Run-Gee Pty Ltd | Lennie Anderson |
| Karuah Indigenous Corporation | David Feeney |

## 2.2 STAGE 2: PRESENTATION OF INFORMATION

The aim of this stage is to provide the RAPs with information regarding the scope of the proposed project and the cultural heritage assessment process.

As the RAPs did not provide their preferred method of receiving information, an information packet was sent to all RAPs and included the required information as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (April 2010). The pack included the required information as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents (April 2010) and a written response to the proposed methods was due no later than 25th February 2021.

The information pack also stipulated that consultation was not employment and requested that in order to assist the proponent in the engagement of field workers, that the groups provide information that will assist in the selection of field staff who may be paid on a contractual basis. This included, but was not limited to, experience in field work and in providing cultural heritage advice (asked to nominate at least two individuals who will be available and fit for work) and their relevant experience; and to provide a CV and insurance details.

The information pack also noted that failure to provide the required information by the nominated date will result in a missed opportunity for the RAPs to contribute to an understanding of their cultural heritage and the project will proceed.

## 2.3 STAGE 3: GATHERING INFORMATION ABOUT CULTURAL SIGNIFICANCE

The aim of this stage is to facilitate a process whereby the RAPs can contribute to culturally appropriate information gathering and the research methodology, provide information that will enable the cultural significance of any Aboriginal objects and or/places within the proposed SAP boundary to be determined and have input into the development of any cultural heritage management options and mitigation measures. In order to do his, included in the information pack sent for Stage 2, was information pertaining to the gathering of cultural knowledge. This included the following information;

- MCH noted that information provided by RAPs may be sensitive and MCH and the proponent will not share that information with all RAPs or others without the express permission of the individual. MCH and the proponent extended an invitation to develop and implement appropriate protocols for sourcing and holding cultural information including any restrictions to place on information, as well as the preferred method of providing information;
- request for traditional/cultural knowledge or information associated with ceremonial, spiritual, mythological beliefs, traditions and known sites from the pre-contact period;
- request for traditional/cultural knowledge or information regarding sites or places with historical associations and/or cultural significance which date from the post-contact period and that are remembered by people today (e.g., plant and animal resource use areas, known camp sites); and
- request for traditional/cultural knowledge or information in relation to any sites or places of contemporary cultural significance (apart from the above) which has acquired significance recently.

Three workshops (12th April, 20th May and 3rd June 2020) were organised with the RAPs to discuss the project, requirements, knowledge and a way forward.

During this process, the RAPs discussed specific traditional/cultural knowledge and information of sites or places associated with spiritual, mythological, ceremonies and beliefs from the pre contact period within the project area or surrounding area. The stakeholders discussed information relating to sites and places of cultural significance associated with the historic and contemporary periods within the project area or surrounding area. The information provided by the RAPs is included in the report and approved for its inclusion by all the RAPs.

## 2.4 SURVEY

Due to the nature of the project (desk top assessment), no survey has been undertaken at this stage of the assessment.

## 2.5 STAGE 4: REVIEW OF DRAFT CULTURAL HERITAGE ASSESSMENT

Copies of the DRAFT report were forwarded to all RAPs for their review and were asked to provide a written or verbal response no later than 14th March 2022.

The cultural values identified in the written responses to the draft report are presented. Comments received by MCH are provided below.

Mur-Roo-Ma Inc is very happy with the report and it meets all their requirements as Traditional Owners and is a true reflection of what has been discussed during the consolation and agrees with the recommendations.

Karuah Indigenous Corporation are happy with the report and recommendations. Worimi LALC were also supportive of the report and recommendations as were Nur-Run-Gee.

All comments received from the RAPs were considered in the final report, all submissions responded to and the draft report altered to include their comments. All RAPs were provided a copy of the final report.

Following initial finalisation of the report design changes were made to the SAP to reduce the overall boundary of the Structure Plan. This report was subsequently updated to reflect the altered boundary. This report will be re-issued to the RAPs for comment concurrently to the public display of this document with this report updated at the end of that review period with any additional comments.

All documentation regarding the consultation process is provided in Appendix A.

# 3 LANDSCAPE AND ENVIRONMENTAL CONTEXT

## 3.1 INTRODUCTION

The nature and distribution of Aboriginal cultural materials in a landscape are strongly influenced by environmental factors such as topography, geology, landforms, climate, geomorphology, hydrology and the associated soils and vegetation (Hughes and Sullivan 1984). These factors influence the availability of plants, animals, water, raw materials, the location of suitable camping places, ceremonial grounds, burials, and suitable surfaces for the application of rock art. As site locations may differ between landforms due to differing environmental constraints that result in the physical manifestation of different spatial distributions and forms of archaeological evidence, these environmental factors are used in constructing predictive models of Aboriginal site locations.

Environmental factors also effect the degree to which cultural materials have survived in the face of both natural and human influences and affect the likelihood of sites being detected during ground surface survey. Site detection is dependent on a number of environmental factors including surface visibility (which is determined by the nature and extent of ground cover including grass and leaf litter etc.) and the survival of the original land surface and associated cultural materials (by flood alluvium and slope wash materials). It is also dependant on the exposure of the original landscape and associated cultural materials (by water, sheet and gully erosion, ploughing, vehicle tracks etc.), (Hughes and Sullivan 1984). Combined, these processes and activities are used in determining the likelihood of both surface and subsurface cultural materials surviving and being detected.

It is therefore necessary to have an understanding of the environmental factors, processes and activities, all of which affect site location, preservation, detection during surface survey and the likelihood of in situ subsurface cultural materials being present. The environmental factors, processes and disturbances of the surrounding environment and specific project area are discussed below.

## 3.2 TOPOGRAPHY

The topographical context is important to identify potential factors relating to past Aboriginal land use patterns. Story et al (1963) divided the Hunter Valley into eight main sub-regions including the Southern Mountains, Central Goulburn Valley, Merriwa Plateau, Liverpool and Mt Royal Ranges, Barrington tops, North-Eastern Mountains, Central lowlands and the Coastal Zone.

The SAP boundary is situated in a Coastal Zone which covers a variety of landforms including inner and outer Holocene dunes, the low lying, swampy interbarrier depression and Pleistocene dunes. The dunal systems overlooking the interbarrier depression and the beach dunes are considered to be suitable for past Aboriginal occupation as they include elevated dunes overlooking the interbarrier depression which would have provided an abundance of resources as would have the beach areas (refer to Section 3.4 for more detail). The SAP boundary consists predominantly of the inter-barrier depression (interbarrier depression: Section 3.4), or swamp lands with dunes along the northern quarter.

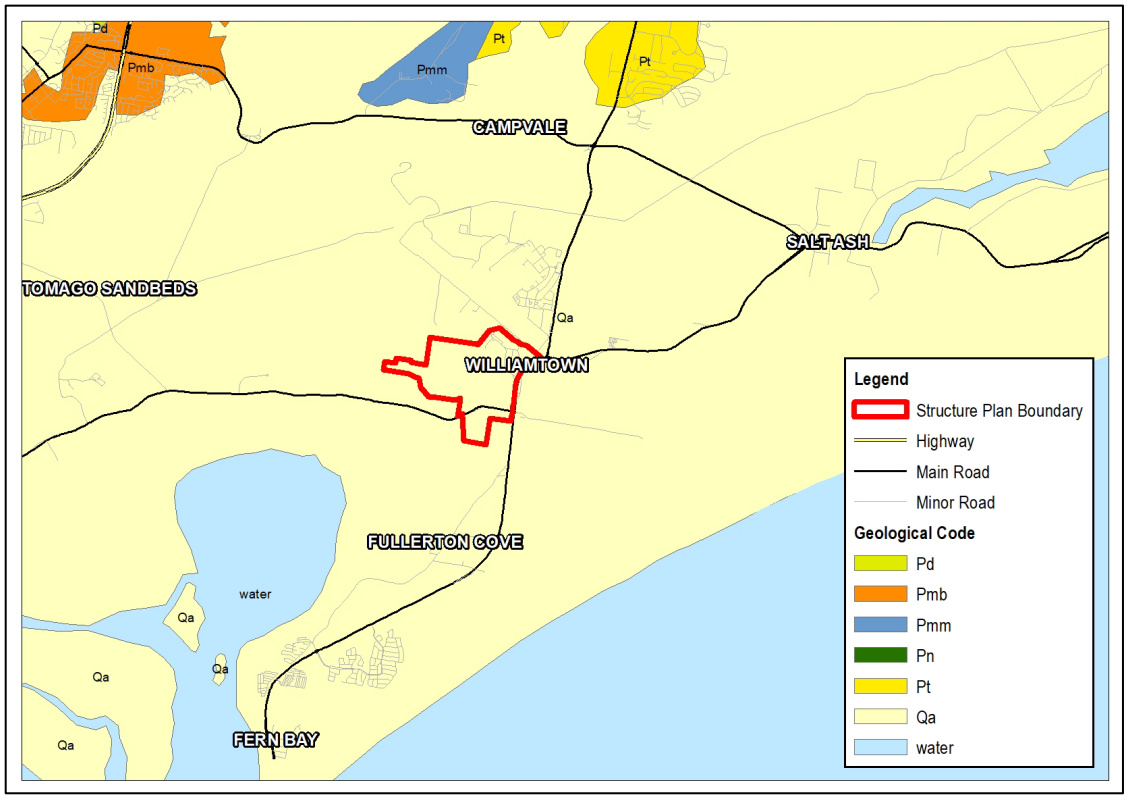
## 3.3 GEOLOGY

The geology of a region is not only reflected in the environment (landforms, topography, geomorphology, vegetation, climate etc.), it also influences past occupation and its manifestation in the archaeological record. The nature of the surrounding and local geology along with the availability and distribution of stone materials has a number of implications for Aboriginal land use and archaeological implications. The implications for past Aboriginal land use mainly relate to

location of stone resources or raw materials and their procurement for manufacturing and modification for stone tools. Evidence of stone extraction, and manufacture, can be predicted to be concentrated in the areas of stone availability. However, stone can be transported for manufacture and/or trading across the region.

As shown in Figure 3.1, the SAP boundary is situated on Quaternary gravel, sand, silt, clay, 'Waterloo Rock', marine and freshwater deposits (Newcastle Geological Map 1966). Materials most dominant in stone tool manufacture throughout the region is tuff that is sourced locally at Birubi Point and other materials such as silcrete, mudstone, and others derive from outside the project rea and when present, were transported/traded into the area.

Figure 3.1 Geology of Williamtown SAP boundary




## 3.4 GEOMORPHOLOGY

Geomorphology is the study of landscapes, their evolution and the processes operating within earth systems. Cultural remains are part of these systems, having being deposited on, and in part, resulting from interactions within landscapes of the past. An understanding of geomorphological patterning and alterations is therefore essential in assess and interpreting the archaeological record.

The SAP boundary is part of the Newcastle Bight sand barrier system, which is bounded in the east and south by the Hunter River and to the north by the bedrock hill slopes at Raymond Terrace (Thom et al. 1992, Matthei 1995). The system incorporates both inner (Pleistocene: c.1.8 million to 10,000 years ago) and outer (Holocene: 10,000 years ago, to today) coastal barriers as well as the inter barrier system. Sediments include marine, estuarine Aeolian and paludal deposits. In addition to the beach ridges behind Stockton Bight there are three sets of transgressive dunes, two of which (landward) have been stabilised by natural vegetation, and the third (coastward) remains transgressive (Robson et al. 1993: 7). Between the inner and the outer barrier is a large inter-barrier depression that is followed by Tilligerry Creek and was originally an extensive lagoon. It is now filled with either

estuarine or fresh water swamp deposits, mud and clay (Robson et al 1993: 7). All of the barrier sands identified as the Tomago sand beds have been mined for heavy minerals in places and are also an important source of groundwater tapped by the Hunter Water Board.

Although there has been a long history of geomorphic study of the barrier systems in this region dating back to Thom (1965) and their evolution has been determined, it is important to note that in recent years the Pleistocene/Holocene coastal chronology has been substantially modified and therefore the conventional model of inner and outer barriers needs to be reconsidered. Recent research has concluded that the dominant source and driver of sand to supply the barrier systems along the NSW coast were the shorefore disequilibrium during Holocene sea-level transgression, with a convex shoreface sand body providing the necessary conditions for onshore-directed sand supply by wave processes (Kinsela et al. 2016).

Stockton Bight is a large exposed south-facing embayment that has acted as a major sediment trap, resulting in a larger than average barrier for the region. It is also, together with the Myall Lakes system, the highest energy and most dynamic system on the NSW coast (Short 2020). The conventional understanding of the geomorphic evolution of the coast in this region is that the inner Pleistocene barrier was deposited during the last Inter Glacial period of high sea level (approximately 120,000 years ago) and was later modified by wind erosion and the development of transgressive sand sheets and freshwater swamps on its western margin. The inner barrier blocked off several valleys to form extensive swamps including the former Grahamstown Swamp that is now beneath the artificial Grahamstown Lake. At the height of the Last Glacial (circa 18,000 years before present [BP]), the sea level rose rapidly sweeping shelf sand before it to form the parallel sets of beach ridges and sales of the outer Holocene barrier. It is usually accepted that sea level reached its present height about 6,000 years BP and that this date marks the beginning of Holocene sand accumulation. The last 3,000 years have seen diminished geomorphic activity, with the most dramatic events being surges of aeolian action behind open-coast beaches. This phenomenon is thought to have initiated the transgressive behaviour noted in dunes along the eastern seaboard dated to around 800 to 250 years ago. More recently the severe storms of 1974 "cracked" the Newcastle Bight foredune, destabilising the landward side and initiating a blowout formation (GBAC 2010).

Young et al. (1993) seriously questioned the conventional model of coastal barrier development and suggested an alternate interpretation with four important elements:

1. That the sea level was at its present height by 7,000 years BP and that it rose another two metres until about 1,500 years BP;
2. Holocene transgressive dune activity varies from place to place and was a consequence of climate variation rather than sea level change;
3. That there was a fall of 2$^{o}$C in sea surface temperature after 3,000 years BP and this coincided with the onset of the present phase of barrier erosion; and
4. That there is evidence of the effects of at least three tsunamis on the NSW south coast in the last 3,000 years.

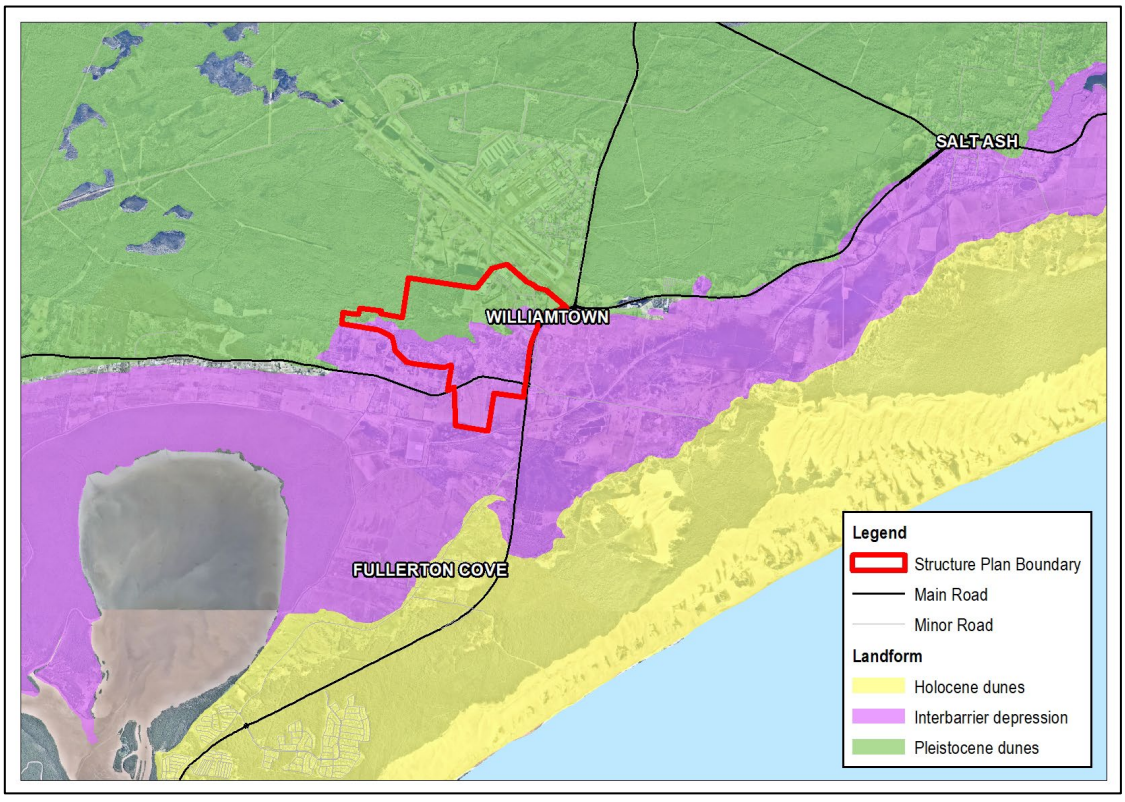
In later work, several of the same authors (Bryant et al., 1997; Haworth et al., 2002) confirmed that barrier formation on the NSW coast extended over 250,000 years with several phases of development and destruction. They also found evidence of remnants of the 'inner barrier' on the south coast with a peak phase of development at about 125,000 years BP when sea level was slightly higher than present. Their suggested explanation of the general absence of the inner barrier on the south coast is that such deposits were destroyed by tsunami, particularly one that occurred between 100,000-110,000 years BP. Murray-Wallace (2002) provided additional support for a prolonged history of barrier development in reporting sea levels for the New South Wales coast at Oxygen isotope Stage 5 (last interglacial, 125,000 years BP) as being consistently about four metres above present sea level.

This is within the range of sea levels reported in many other parts of Australia for the last eleven inter-glacials. In applying these points to the Newcastle Barriers and to the Williamtown SAP it should be noted that:

- The landward parts of the inner barrier may be substantially older than previously appreciated;
- That a mid-Holocene higher sea level could have an important influence on erosion and deposition of the outer barrier and on sediments and features in the Hunter estuary;
- That the ages of transgressive dune sheets need not be coincident from place to place; and
- That evidence of tsunami may also occur on the north coast.

The SAP boundary is roughly bounded by Fullerton Cove to the west, Tilligerry National Park and the Williamtown RRAF Base to the north, and the Stockton Bight foredunes to the south (Figure 3.2). The area south of the SAP boundary is dominated by Holocene saline swamps, with small pockets of estuarine in-channel bar and beach and estuarine shoreline ridge and dune. The northern section of the SAP boundary is dominated by Pleistocene dunes with considerable pockets of beach-ridge swale and dune-deflation hollows, and smaller areas containing Holocene freshwater swamps. The difference between the degree of soil development on inner and outer barrier sands can be attributed to the difference in age and the period of profile leaching. Periods of active dune movement may either re-work and effectively destroy archaeological sites or bury older land surfaces and potentially present sites. Although there is a good potential for in-situ sites in stable dune areas (both in Holocene and Pleistocene dunes), a range of other preservation factors including wind and water erosion, groundwater fluctuation and European disturbance may have influenced local site patterning. As illustrated in Figure 3.2, the SAP boundary consists predominantly of the interbarrier depression (previously a lagoon) with dunes overlooking the interbarrier depression to the north.

Figure 3.2 Geomorphology of the Williamtown SAP boundary



## 3.5 SOILS

The nature of the surrounding soil landscape also has implications for Aboriginal land use and site preservation, mainly relating to supporting vegetation and the preservation of organic materials and burials. The deposit of alluvial and aeolian sediments and colluvium movement of fine sediments (including artefacts) results in the movement and burying of archaeological materials. The increased movement in soils by this erosion is likely to impact upon cultural materials through the post-depositional movement of materials, specifically small portable materials such as stone tools, contained within the soil profiles. The soil landscapes within the SAP boundary are summarised in Table 3.1 and derive from Matthei 1995 and illustrated in Figure 3.3.

Figure 3.3 Soil landscapes of the SAP boundary (Matthei 1995)

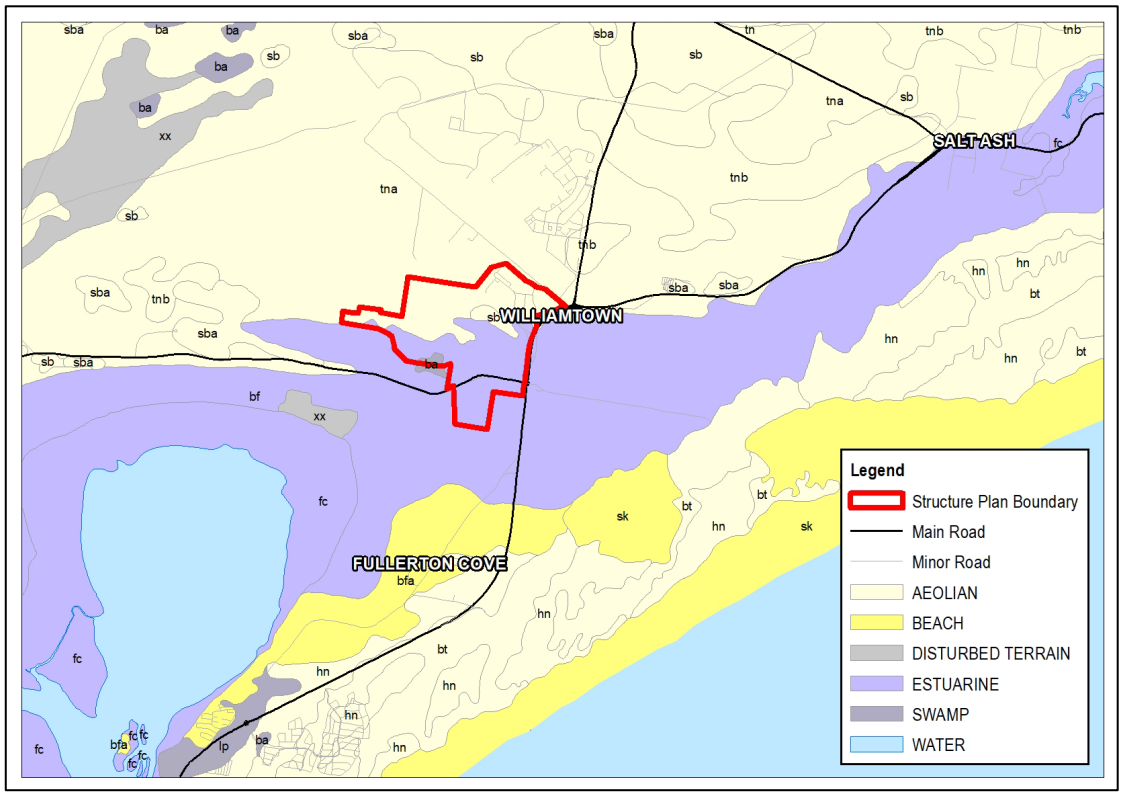



Table 3.1 Soil landscapes of the SAP boundary

| Soil Landscape | | | Description |
|---|---|---|---|
| sb | Shoal Bay | Aeolian | Located on the well-drained Pleistocene sandy sheets and low dunes, the A1 Horizon (10-40cm) includes brownish grey loose sand that ranges from brownish black to brownish grey in colour with a speckled appearance, includes few grave sized charcoal fragments. The A2 Horizon includes bleached light grey loose sand (60-260cm) and the B Horizon includes coherent organic and iron-stained sand that is a combination of black to brownish black to a dull yellow orange colour. Boundaries are sharp. |
| bf | Bobs Farm | Estuarine | Situated on broad, flat, swampy, Holocene estuarine plains. A horizon of black organic loam up to 30cm that overlays the B horizon of grey plastic estuarine clay that is 20-80cm deep. This occasionally overlies >50 centimetres of saturated greyish yellow brown massive sandy clay loam. The boundaries between soils are sharp and total soil depth exceeds 300 centimetres. |

| Soil Landscape | | | Description |
|---|---|---|---|
| ba | Blind Harrys Swamp | Swamp | Situated on level to very gently inclined closed depressions (coastal swamps) usually occupying swales and deflation areas with extremely low relief. Consists of a black litter layer of spongy dark organic-rich loam to silty loam to 10cm thick that overlies 10-30cm of black organic fibrous peat (O horizon) that overlays >50cm of a saturated olive brown mottled sand (C horizon). |
| xx | Disturbed Terrain | | Level plain to hummocky terrain, extensively disturbed by human activity, including complete disturbance, removal or burial of soils. Landfill areas include soils, rock, building and waste material and the original vegetation has been completely cleared. |

## 3.6 CLIMATE

Climatic conditions would also have played a part in past occupation of an area as well as impacted upon the soils and vegetation and associated cultural materials. Rainfall throughout the area is summer-autumn dominated with minimum rainfall occurring during late winter and early spring. Average annual rainfall is highest along the coast (1,142mm) and decreases westwards (913mm). The maximum monthly rainfall occurs along the coast during March and the average minimum occurs in July and August. Average monthly maximum temperatures are highest in the west (190 in December and January) and the average minimum range from 40C in July to 8.20C (Matthei 1995:5). During summer, the increased rainfall rate and reduced ground cover is reflected in a proportionately higher risk of erosion.

## 3.7 WATERWAYS

One of the major environmental factors influencing human behaviour is water as it is essential for survival and as such people will not travel far from reliable water sources. In those situations where people did travel far from reliable water, this indicates a different behaviour such as travelling to obtain rare or prized resources and/or trade. Proximity to water not only influences the number of sites likely to be found but also artefact densities. The highest number of sites and the highest density are usually found in close proximity to water and usually on an elevated landform. This assertion is undisputedly supported by the regional archaeological investigations carried out in the region where by such patterns are typically within 50 metres of a reliable water source.

The main types of water sources include permanent (rivers and soaks), semi-permanent (large streams, swamps and billabongs), ephemeral (small stream and creeks) and underground (artesian). Stream order assessment is one way of determining the reliability of streams as a water source. Stream order is determined by applying the Strahler method to 1:25 000 topographic maps. Based on the climatic analysis, the project area will typically experience comparatively reliable rainfalls under normal conditions and thus it is assumed that any streams above a third order classification will constitute a relatively permanent water source. The Strahler method dictates that upper tributaries do not exhibit flow permanence and are defined as first order streams. When two first order streams meet, they form a second order stream. Where two-second order streams converge, a third order stream is formed and so on. When a stream of lower order joins a stream of higher order, the downstream section of the stream will retain the order of the higher order upstream section (Anon 2003; Wheeling Jesuit University 2002).

When assessing the relationship between sites and water sources it must be noted that the Australian continent has undergone significant environmental changes during the past 60,000 years that people have lived here and that Pleistocene sites (older than 10,000 years) would have been located in relation to Pleistocene water sources that may not exist today. Stone tool type will assist with the age of sites (Pleistocene or Holocene). The SAP boundary includes the resource rich inter-barrier

depression or swamp (previous lagoon/estuary). The area was very well resourced in terms of fresh water and associated resources as well as marine resources. The interbarrier depression was clearly favoured for hunting and gathering with little to no evidence of past Aboriginal land uses with the elevated dunes overlooking the interbarrier depression and the beach areas having being favoured for camping in close proximity to these resources.

## 3.8 FLORA AND FAUNA

The availability of flora and associated water sources affect fauna resources, all of which are primary factors influencing patterns of past Aboriginal land use and occupation. The assessment of flora has two factors that assist in an assessment including a guide to the range of plant resources used for food and medicine and to manufacture objects including nets, string bags, shields and canoes which would have been available to Indigenous people in the past. The second is what it may imply about current and past land uses and to affect survey conditions such as visibility, access and disturbances. The drainage throughout the project area would have supported a range of faunal populations including kangaroo, wallaby, goanna, snakes and a variety of birds and seafood as well as medicinal resources.

## 3.9 LAND USES AND DISTURBANCES

Based upon archaeological evidence, the occupation of Australia extends back some 40,000 years (Mulvaney and Kamminga 1999) whilst Aboriginal people have been present within the Hunter Valley for at least 20,000 years (Koettig 1987). Although the impact of past Aboriginal occupation on the natural landscape is thought to have been relatively minimal, it cannot simply be assumed that 20,000 years of land use have passed without affecting various environmental variables. The practice of 'firestick farming' whereby the cautious setting of fires served to drive game from cover, provide protection and alter vegetation communities significantly influenced seed germination, thus increasing diversity within the floral community.

Following European settlement of the area in the 1820s, the landscape has been subjected to a range of different modifactory activities including extensive logging and clearing, agricultural cultivation (ploughing), pastoral grazing, residential developments and mining (Turner 1985). The associated high degree of landscape disturbance has resulted in the alteration of large tracts of land and the cultural materials contained within these areas. Large sections of the SAP boundary have been subject to agricultural and pastoral activities and other major land uses include business and residential developments, industrial and aviation as well as recreation, mixed uses and conservation areas. The majority of the SAP boundary has been utilised for agricultural and pastoral activities whilst the north-eastern section has been utilised for airport facilities, petrol station, hotel and the aerolab, all involving clearing, excavation and fill methods for construction.

In terms of these land uses and impacts on the landscape and cultural materials that may be present, early vegetation clearing included the uprooting of trees by chaining will disturbed or destroy that may be present near or underneath trees and vegetation. Farming and agricultural activities also disturbed the landscape. Although pastoralism is a comparatively low impact activity, it does result in disturbances due to vegetation clearance and the trampling and compaction of grazed areas. These factors accelerate the natural processes of sheet and gully erosion, which in turn can cause the horizontal and lateral displacement of artefacts. Furthermore, grazing by hoofed animals can affect the archaeological record due to the displacement and breakage of artefacts resulting from trampling (Yorston et al 1990). Pastoral land uses are also closely linked to alterations in the landscape due to the construction of dams, fence lines and associated structures. As a sub-set of agricultural land use, ploughing typically disturbs the top 10-12 centimetres of topsoil (Koettig 1986) depending on the method and machinery used during the process. Ploughing increases the occurrence of erosion and

can also result in the direct horizontal and vertical movement of artefacts, thus causing artificial changes in artefact densities and distributions. In fact, studies undertaken on artefact movement due to ploughing (e.g., Roper 1976; Odell and Cowan 1987) has shown that artefact move between one centimetre up to 18 metres laterally depending on the equipment used and horizontal movement. Ploughing may also interfere with other features and disrupt soil stratigraphy (Lewarch and O'Brien 1981). Ploughing activities are typically evidenced through 'ridges and furrows' however a lengthy cessation in ploughing activities dictates that these features may no longer be apparent on the surface.

Excavation works required for developments, including but not limited to business, residential, industrial, aviation and associated infrastructure and utilities as well as the illegal removal of soils require the excavation, cut and fill methods. These direct impacts to the land and associated cultural materials that may be present are easy to see and understand. Any form of construction or resource exploitation that involves the removal of, relocation of or compaction or soils sediments or minerals, requires the modification of the topography, thus displacing and/or destroying any cultural materials that may have been present Wood 1982). In terms of everyday land uses, the impacts of vehicular movements on sites have been well documented and based on several experiments (DeBloois, Green and Wylie 1974, Gallagher 1978), it has been shown that vehicle movements over an archaeological site is extremely destructive to the site through compaction and movement thus altering the spatial relationship and location of the artefacts. Based on general observations it is expected that the creation of dirt tracks for vehicle access would result in the loss of vegetation and therefore will enhance erosion and the associated relocation of cultural materials. Dumping of rubbish would have impacted on site through vehicular access (tracks) and movement of surface artefacts through the actual 'dumping' of rubbish.

## 3.10 NATURAL DISTURBANCES

It must be recognised that the disturbance of cultural materials can also be a result of natural processes. The patterns of deposition and erosion within a locality can influence the formation and/or destruction of archaeological sites. Within an environment where the rate of sediment accumulation is generally very high, artefacts deposited in such an environment will be buried shortly after being abandoned. Frequent and lengthy depositional events will also increase the likelihood of the presence of well-stratified cultural deposits (Waters 2000:538,540).

In a stable landscape with few episodes of deposition and minimal to moderate erosion, soils will form and cultural materials will remain on the surface until they are buried. Repeated and extended periods of stability will result in the compression of the archaeological record with multiple occupational episodes being located on one surface prior to burial (Waters 2000:538-539). Within the duplex soils artefacts typically stay within the A horizon on the interface between the A and B horizons.

If erosion occurs after cultural material is deposited, it will disturb or destroy sections of archaeological sites even if they were initially in a good state of preservation. In the local area, burials and shell middens are the most visually obvious site the that are commonly exposed on the sand dunes. The more frequent and severe the episodes of erosional events the more likely it is that the archaeological record in that area will be disturbed or destroyed (Waters 2000:539; Waters and Kuehn 1996:484). Regional erosional events may entirely remove older sediments, soils and cultural deposits so that archaeological material or deposits of a certain time interval no longer exist within a region (Waters and Kuehn 1996:484-485).

The role of bioturbation is another significant factor in the formation of the archaeological record. Post-depositional processes can disturb and destroy artefacts and sites as well as preserve cultural materials. Redistribution and mixing of cultural deposits occur as a result of burrowing and mounding by earthworms, ants and other species of burrowing animals (Arnour-Chelu and Andrews 1994). Artefacts can move downwards through root holes as well as through sorting and settling due to gravity. Translocation can also occur as a result of tree falls (Balek 2002:41-42; Peacock and Fant 2002:92). Depth of artefact burial and movement as a result of bioturbation corresponds to the limit of major biologic activity (Balek 2002:43). Artefacts may also be moved as a result of an oscillating water table causing alternate drying and wetting of sediments, and by percolating rainwater (Villa 1982:279).

Experiments to assess the degree that bioturbation can affect material have been undertaken. In abandoned cultivated fields in South Carolina, Michie (summarised in Balek 2002:42-43) found that over a 100-year period 35% of shell fragments that had been previously used to fertilise the fields were found between 15 and 60 centimetres below the surface, inferred to be as a result of bioturbation and gravity. Earthworms have been known to completely destroy stratification within 450 years (Balek 2002:48). At sites in Africa, conjoined artefacts have been found over a metre apart within the soil profile. The vertical distribution of artefacts from reconstructed cores did not follow the order in which they were struck off (Cahen and Moeyersons 1977:813). These kinds of variations in the depths of conjoined artefacts can occur without any other visible trace of disturbance (Villa 1982:287).

However, bioturbation does not always destroy the stratigraphy of cultural deposits. In upland sites in America, temporally-distinct cultural horizons were found to move downwards through the soil as a layer within minimal mixing of artefacts (Balek 2002:48).

## 3.11 DISCUSSION

The regional environment provided resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area. Within the SAP boundary, the landforms of the Pleistocene dunal systems overlooking the interbarrier depression have proven to be favoured for past Aboriginal land use with an abundance of sites and a variety of site types throughout these landforms, both on the surface and subsurface.

In relation to modern alterations to the landscape, in locations where agricultural activities have occurred, minimal to moderate impact to cultural materials would have occurred whilst in locations where construction works have occurred, significantly high impacts to the archaeological record can be expected. On the other hand, in locations where reduced past land uses have occurred, minimal to no impacts to the archaeological record may be expected. In terms of subsurface cultural materials, these are present throughout the area and would only have been impacted through excavation works. Because of the natural and cultural processes discussed above, site integrity cannot be assumed for the SAP boundary. However, the existence of in situ cultural materials cannot be ruled out.

# 4 CULTURAL CONTEXT

## 4.1 TRADITIONAL KNOWLEDGE

[Removed from Public Display]

## 4.2 WORIMI COUNTRY

[Removed from Public Display]

## 4.3 WORIMI KEEPING PLACE

A Keeping Place for Worimi Aboriginal cultural heritage has been created around a burial site and associated artefact scatter near the Newcastle Airport. The extent of this Keeping Place, which is on a raised elevation, was determined in consultation with the Worimi during a heritage assessment undertaken in 2007 and included the burial, scatter and landform setting. The area is to be excluded from all future development, with no disturbance of the vegetation or sand dunes permitted. It was anticipated in the original heritage assessment that salvaged cultural heritage material from the surrounding area would be relocated to the Keeping Place (GHD 2007).

# 5 ETHNOHISTORIC ACCOUNTS

Although ethnographic accounts do not consider or discuss Aboriginal relationships to the land and its significance, they do provide insights into some past Aboriginal activities, some of which leave evidence in the landscape (tangible sites) and can be confirmed through archaeological investigations. Intangible sites, such as mythological, storytelling etc., cannot be confirmed by archaeological investigations and are rarely recorded by early explores and such traditional knowledge is vital in understanding the cultural landscape.

Anthropologists and ethnographers have attempted to piece together a picture of past Aboriginal societies throughout the Hunter Valley. Although providing a glimpse into the past, one must be aware that information obtained on cultural and social practices were commonly biased and generally obtained from informants including white settlers, bureaucrats, officials and explorers. Problems encountered with such sources are well documented (e.g., Barwick 1984; L'Oste-Brown et al 1998). There is little information about who collected information or their skills. There were language barriers and interpretation issues, and the degree of interest and attitudes towards Aboriginal people varied in light of the violent settlement history. Access to view certain ceremonies was limited. Cultural practices (such as initiation ceremonies and burial practices) were commonly only viewed once by an informant who would then interpret what he saw based on his own understanding and then generalise about those practices.

## 5.1 WORIMI ETHNO-HISTORIC ACCOUNTS

Early ethnographic records of the Port Stephens area are limited. Port Stephens consists of the submerged estuary of the Myall and Karuah Rivers. The area was described by surveyor Charles Grimes in 1795 as inhabited by the Worimi Tribe, whom he described as "taller" and "stouter" than Aboriginal people of the Sydney area, utilising a completely different language (Dowd, undated; Port Stephens Council, 2009). Prior to contact with settlers, the Worimi people extended from Port Stephens to Forster/Tuncurry in the north and west out to Gloucester. The Worimi comprised a number of tribes who lived on the water's edge and utilised both land and sea resources in their daily lifestyles (Leon, 1998; Port Stephens, 2011). These tribes included the Garuagal, Maiangal, Gamipingal, Garrawerrigal, Buraigal, Warringal, Birroongal, Birrimbai, Yeerungal and Wallamba (Enright 1900; Sokoloff 1975, 1976, 1977; Leon 1998).

Social organisation for the Worimi included aspects such as leadership, government, punishments, duels, fights, marriage, totemism and family structure, within a social system that had both spiritual and social significance. Leadership was based around leading men, being older and fully initiated, who acted as general advisers. Disputes between groups for such things as territorial infringement were settled through battles, enacted to satisfy honour rather than being matters of mortal combat. Marriages were arranged by both kindred and parents; a number of patrilineal totemic clans had a bearing on both kinship and marriage, ensuring that strict laws were maintained, preserving tribal strength and avoiding in-breeding (Sokoloff 1976). In 1830 Robert Dawson described the Worimi Tribe as utilising spears and shields, wearing belts of opossum fur, and using combs formed from the leg bones of kangaroos (Dawson 1830: 115). Bark was described as an essential material used in the production of numerous items. Notches were cut into trees "large enough only [to] place the great toe in" to enable easy climbing to strip bark "in lengths from three to six feet" (Dawson 1830: 19). This bark was used for covering huts; bark was also utilised for making string "as good as you can get in England, by twisting and rolling it in a curious manner with the palm of the hand on the thigh" to make nets, fishing lines and bags (Dawson 1830: 67). Sally Wattle and Kurrajong tree barks were used in making string; fishing lines were waterproofed with the sap of the Bloodwood tree (Port Stephens Council 2009).

The importance of the ocean as a source of food resource for the Worimi people in the Port Stephens area was noted in multiple sources, as were land resources for tools. Fish hooks, for example, were made from oyster and pearl shells and yellow gum from the Grass Tree was used in manufacture to affix the disparate elements together (Dawson 1830: 67; Port Stephens Council 2009). Spears were also used for fishing, made from the flowering stem of the Grass Tree or Gymea Lily, with prongs of ironbark used on the tips. Other hunting tools and weapons were also manufactured from plants, including Boomerangs, which were made from wild Myrtle (Sokoloff 1975; Port Stephens Council 2009). As well as utilising plant resources in tool manufacture, many were also used as food resources. The Gymea Lily's young flowering spikes were fire roasted and eaten after being soaked in water. Wild Cape Gooseberries grew on the nearby Cabbage Tree Island and were a highly prized food resource. Other items such as Fern root and daisy yam were a necessary supplement to diet, especially when there was a scarcity of the primary food resource of fish (Sokoloff 1977; Port Stephens Council 2009).

As viewing of rituals and ceremonies by Europeans was restricted, little is known of these past practices. However, it is known that sacred and ceremonial activities were linked with the Aboriginal relationships with the land. Ground burials were the most common form of final internment inland. A shallow grave was dug and lined with grass. The deceased was wrapped in paperbark, tied up, placed in the grave, covered with grass, covered with another layer of bark and a final layer of grass and then covered with earth building up a mound (Bluff 1989). In the Port Stephens area burial practices appear to have varied and may in part have been determined by the environment (as well as social structure). Informants for Howitt (1996:465) state that in the area the body of the deceased was neatly folded in bark and placed in the grave at flood-tide. It was never placed at ebb as it was believed the retiring water would bear the spirit of the deceased to some distant country. An old couple who only had one daughter who died, built their hut over her grave close to the shore of the harbour and lived there many months. They then moved their hut a few yards away and remained there until the grass had completely covered the grave. They then left and never visited the grave again.

# 6 ARCHAEOLOGICAL CONTEXT

A review of the archaeological literature of the region, and more specifically the local area and the results of an AHIMS search provide essential contextual information for the current assessment. Thus, it is possible to obtain a broader picture of the wider cultural landscape highlighting the range of site types throughout the region, frequency and distribution patterns and the presence of any sites within the project area. It is then possible to use the archaeological context in combination with the review of environmental conditions to establish an archaeological predictive model for the project area for tangible sites.

## 6.1 ABORIGINAL HERITAGE INFORMATION MANAGEMENT SYSTEM

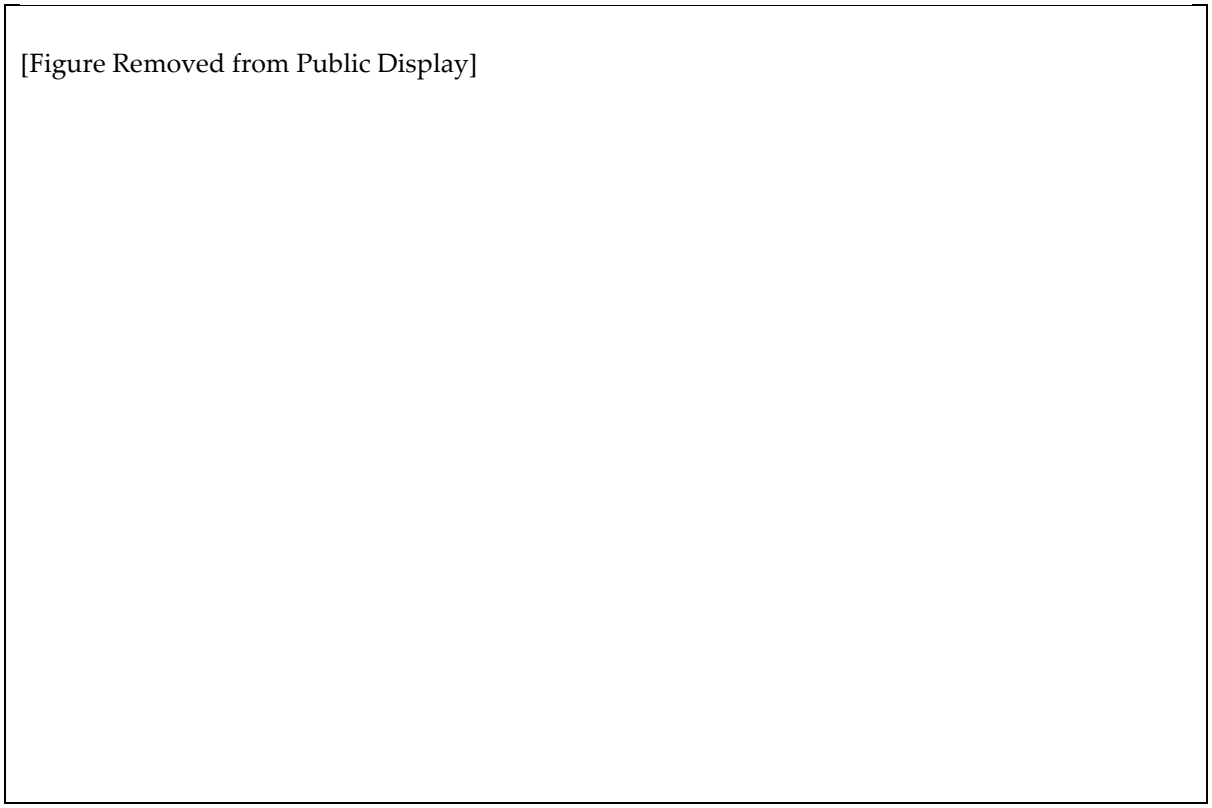
MCH note that there are many limitations with an AHIMS search. Firstly, site coordinates are not always correct due to errors and changing of computer systems at AHIMS over the years that failed to correctly translate old coordinate systems to new systems. Secondly, few sites have been updated on the AHIMS register to notify if they have been subject to a s87 or s90 and as such what sites remain in the local area and what sites have been destroyed, to assist in determining the cumulative impacts, is unknown. In addition to this, other limitations include the number of studies in the local area. Fewer studies suggest that sites have not been recorded, ground surface visibility also hinders site identification and the geomorphology of the majority of NSW soils and high levels of erosion have proven to disturb sites and site contents, and the extent of those disturbances is unknown (i.e. we do not know if a site identified at the base of an eroded slope derived from the upper crest, was washed along the bottom etc.: thus altering our predictive modelling in an unknown way). Thus, the AHIMS search is limited and provides a basis only aids only in predictive modelling. The new terminology for site names including (amongst many) an 'artefact' site encompasses stone, bone, shell, glass, ceramic and/or metal and combines both open camps and isolated finds into the one site name. Unfortunately, this greatly hinders in the predictive modelling as different sites types grouped under one name provided inaccurate data.

A search of the AHIMS register has shown that seven known Aboriginal sites are currently recorded within one kilometre of the SAP boundary and these are summarised in Table 6.1 and their approximate location in Figure 6.1. This excludes sites identified within the RAAF Base (Commonwealth) land as there is no legislative requirement for sites on Commonwealth land to be registered on AHIMS.

Table 6.1 Summary of AHIMS sites

| Site type | Number | % |
|---|---|---|
| Artefact (AFT) | 5 | 71.4% |
| Artefact/Potential Archaeological Deposit/Hearth (AFT/PAD/HTH) | 1 | 14.3% |
| Artefact/Burial (AFT/BUR) | 1 | 14.3% |
| **Subtotal** | **7** | **100%** |

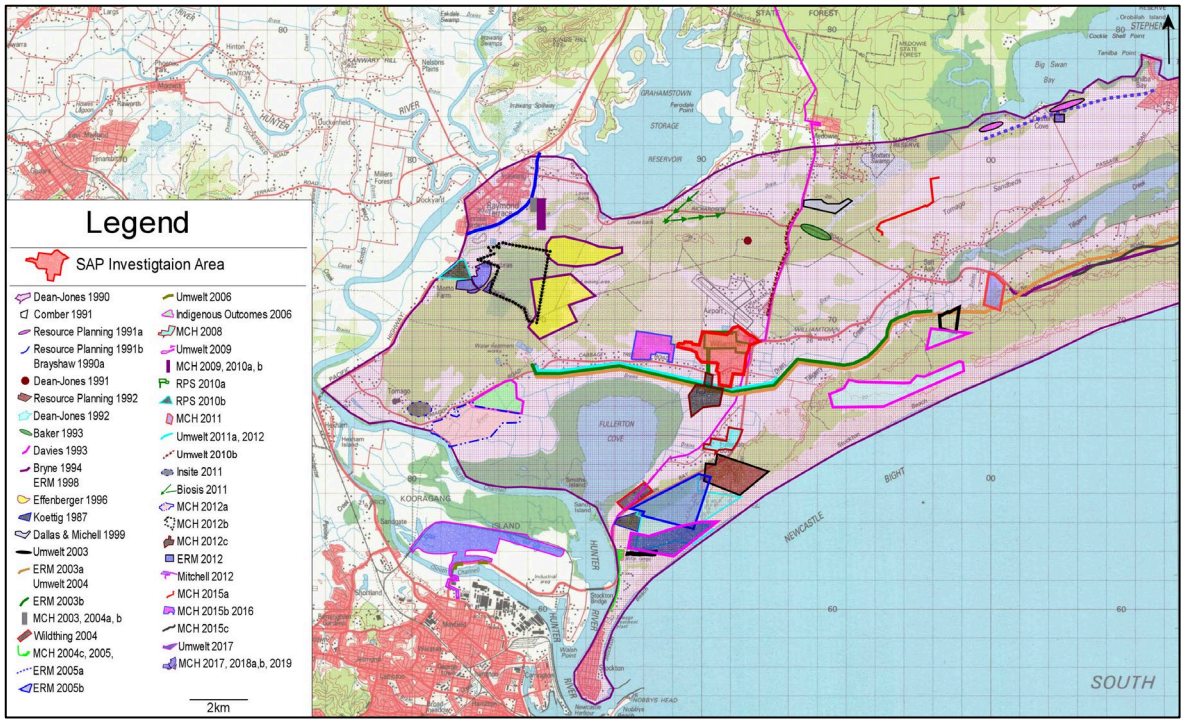
Figure 6.1 Approximate location of AHIMS sites




## 6.2 ARCHAEOLOGICAL CONTEXT

All archaeological surveys throughout the area have been undertaken in relation to environmental assessments for developments. The most relevant investigations indicate differing results and observations based on surface visibility and exposure, alterations to the landscape (including mining, industrial and residential development), proximity to water sources and geomorphology. The reports available from AHIMS are summarised below, their approximate locations illustrated in Figure 6.2 (where maps were available) and detailed summaries are provided in Appendix C.

Figure 6.2 Approximate location of local assessments




The definition of site curtilages in NSW are guided by the requirements for site registration in the AHIMS database, leading to geographically discrete sites as individual entities, existing in isolation. Such an approach is understandable, as it grows from the need to define sites as per legislatively guided parameters. This is further reinforced by the geographically focussed work of consultant archaeologists, limiting their analysis to a specific geographically constrained area based on individual project specifications (predominantly here related to proposed transmission lines, road bypasses, sand mining activities and other developments). While this is the common practice for recording individual sites, it is important to contextualise them within a broader archaeological and cultural landscape that links them together. In this way assemblages may be understood as a continuous scatter of cultural material across the landscape and the nature of activities and occupation can be identified through the analysis of artefact distributions across a landscape. In the case of this region there is a variety of evidence indicative of long-term Aboriginal habitation and a variety of land uses, particularly in relation to the Newcastle Bight sand system, which incorporates both inner (Pleistocene: c. 1.8 million to 10 000 years ago) and outer (Holocene: 10 000 years ago) coastal barriers as well as the interbarrier system.

Exploitation of swamp and wetland resources (the interbarrier depression) figured prominently in the lifestyle of the Worimi people as evidenced by the abundance of sites along both the Pleistocene and Holocene dunes overlooking this area as evidenced through a plethora of past archaeological assessments throughout the area (refer to Appendix C). Swamps such as the interbarrier depression were favoured with dense complex occupation sites along its fringes.

Of particular relevance to this study is the Dean-Jones' (1990) study. Dean-Jones undertook a detailed assessment of the nature and distribution of Aboriginal archaeological sites within both the Inner and Outer Barrier of Stockton Bight. The results of this assessment re-defined previous findings and predictive modelling with her findings on the Holocene dune sequence. The sites along the interbarrier margin and crests of the 4,500 BP Holocene dunes were assessed as holding high scientific significance and sites tended to retain stratigraphic integrity to depths of 30-40 cm. Some

of these sites also contain charcoal which can be used for dating purposes. Dean-Jones suggested that the distribution and density of sites recorded along the face of the old Holocene dunes at the interbarrier depression suggests that this geomorphic environment has a high archaeological sensitivity and that many more sites are likely to be situated in this area. Dean-Jones identified geomorphic units within the Outer Barrier as having high archaeological sensitivity as follows:

- the seaward margin of the active transgressive dunes and the landward margin of the deflation basin, with the assumption being that the majority of sites in this context were associated with former;
- stabilised soil surfaces but have been exposed and/or deflated by dune transgression; and
- stabilised dunes bordering the Inter-Barrier depression; and
- estuarine shorelines.

The inner Pleistocene dunes overlooking the interbarrier depression have also proven to be of high archaeological significance with evidence of past Aboriginal land use and occupation extending along the interbarrier margins and crests with one of the most significant sites identified, Moffats Swamp. Baker (1993) completed archaeological excavations across a series of large vegetated sand dune crests directly across Richardson Road from Moffats Swamp, Medowie between Newcastle and Port Stephens, NSW. Landforms across the SAP boundary consisted predominantly of swampland with associated dunes. Moffats Swamp was the main water source in the area, one of a series of swamps which occurred at the inner margin of the Newcastle Bight sandy country. It was noted that artefacts and shell material had been uncovered during sand extraction activity in the surrounding region and other sites in the general area consisted predominantly of artefact scatters and middens. It was predicted that sites were most likely to occur on dune crests in association with water. This prediction was proved accurate by the results of the archaeological testing. Two sites were identified during subsurface testing across the area, both on dune crests and subsequent salvage provided evidence of past Aboriginal occupation in the inner Pleistocene barrier dated to 17,376 BP at Moffat's Swamp (Baker 1994).

Interestingly, ERMs' (2003) assessment for the proposed Electricity Supply upgrade between Tomago and Tomaree covered the three major units of the Newcastle Bight dune system, these being the inner Pleistocene barrier, the interbarrier depression and the outer barrier Holocene dune system with significant results. Ten new sites were identified and five previously recorded sites were found and seven PADs identified (two located on the Inner Pleistocene barrier system and five on the Holocene Barrier System). Consisting of shell middens with artefacts, ERM identified sites along the dunes overlooking the interbarrier depression, a reduction in sites in the dunes seaward and an increase in sites in closer proximity to the beach. ERM and MCH (2015) also noted that the distribution of shell species across the dune field suggests that shellfish were not transported across the barrier system. Sites with pipi (a marine species) are confined to the outer margin of the barrier and sites with *Pyrazus* and oyster (estuarine species) distributed across the inner barrier.

More recently, Mitchell and Lillis (in prep) undertook an archaeological desk top sensitivity mapping and geomorphological assessment within the probable maximum flood (PMF) boundaries at various locations throughout the Hunter Valley region including the Hunter Estuary and inter-barrier environment along Tilligerry Creek. The objective of the assessment was to consider the known and potential Aboriginal cultural heritage sites within these locations in relation to past land uses and the potential effects of climate change. The findings in relation to known and potential Aboriginal sites for each of the landscapes within the investigation is summarised here.

The estuarine plan landscape is identified as an extensive area shared between Newcastle City and Port Stephens Shire. It included all of the Hunter River estuary, the lower reaches of the Williams River, the Port of Newcastle and almost all of the inner coastal barrier. Subaqueous landforms were assessed as unlikely to contain Aboriginal sites and bars, beach and shoreline ridge areas were assessed as having the potential to contain shell middens and burials. It was also argued that the estuarine swamps had swamp soils that could preserve organic artefacts and possible traces of eel channels/drains and areas of cultural significance were noted as possible. Estuarine plain areas were considered to only have limited archaeological potential.

Labelled as the Newcastle and estuary, Mitchell and Lillis (in prep) identified that the wetlands surrounding Fullerton Cove had been modified by levee and drain construction with concentrations of natural shell exposed in drains. Tilligerry Creek was noted as having large deposits of modern oyster shell, and it was noted this should not be confused with Aboriginal shell middens.

The coastal barrier landscape unit consisted of two stacked barrier systems present at the mouth of the Hunter River. Beach areas were assessed as areas where reworked artefacts had the potential to occur and the foredunes were considered to be locations where reworked artefacts and burials could occur. Outer backbarrier flats were considered to contain isolated artefacts only. Inner-barrier dunes were assessed as having the potential to contain open sites, middens, burials and culturally modified trees and the inner-barrier beach ridges and inner backbarrier flats were assessed as only likely to contain isolated artefacts.

The inner and outer barrier landform consists of the inner barrier (inland) (32 kilometres long) and attached to bedrock at Tanilba/Mallabula and Hexham. Ground penetrating radar surveys suggested that the barrier was not homogenous, with intervals of shoreline progradation interspersed with channel deposits. It was also noted that some shoreline disjuncts could preserve Aboriginal sites in subsurface deposits. The outer barrier was similar in stratigraphy to the inner barrier in containing a topographically lower, transgressive facies with marine shells, and an overlying regressive facies of beach ridges and dunes. The outer barrier began to accumulate marine sand in the early Holocene and extended from Stockton for 34 kilometres to Morna Point at Anna Bay. Approximately 200 Aboriginal sites were exposed and eroded in the mobile dunes, with the potential for further unknown sites to be present in less disturbed sections or covered by drifting sand.

Land between the two barriers is occupied by Tilligerry Creek and an excavated drain that almost connected Fullerton Cove to Port Stephens. On the coastal side of the creek a back barrier flat was formed by storm wave wash over deposition at the time when the outer barrier was first formed. There are Aboriginal middens along the creek which contain both estuarine and open ocean species with reported dates of 2,000 to 3,000 Before Present (BP). Both barriers had been occupied and used by Aboriginal people. Aboriginal people would not have used the inner barrier as it was forming as those pre-dates the presence of Aboriginal people, but it was stated that they definitely occupied it in later periods. The beach ridges in the inner-barrier provided well defined, dry, routes through the sand dune country and it was assessed as likely that they may contain important, as yet unidentified, sites.

Figure 6.3, provides the archaeological sensitivity map (adapted from Mitchell, Lillis and Virtus Heritage in prep, Figure 47). As illustrated in Figure 6.4, the Structure Plan revised area consists of mainly estuarine swamps, with the Inner barrier dune along Nelson Bay Road and in the northern portion of the project area with small areas of Inner Barrier Beach Ridges also in the north.

Figure 6.4 Archaeological sensitivity map (Mitchell, Lillis & Virtus Heritage, in prep)

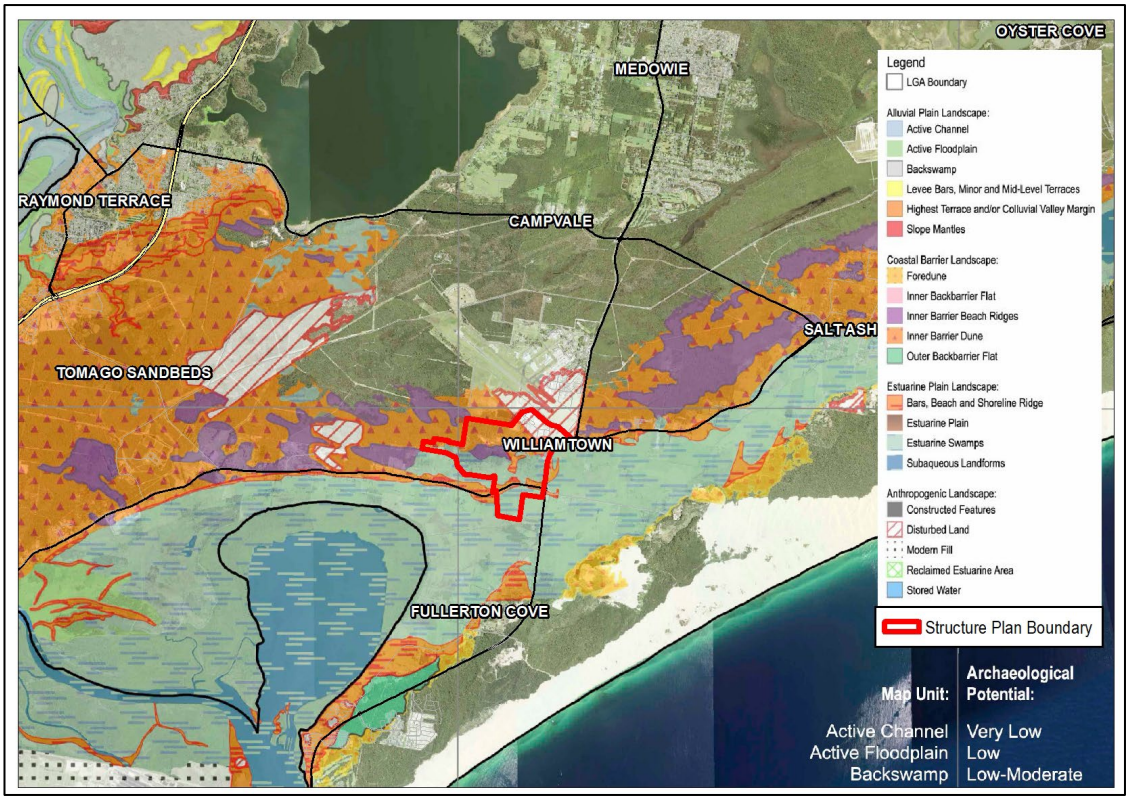
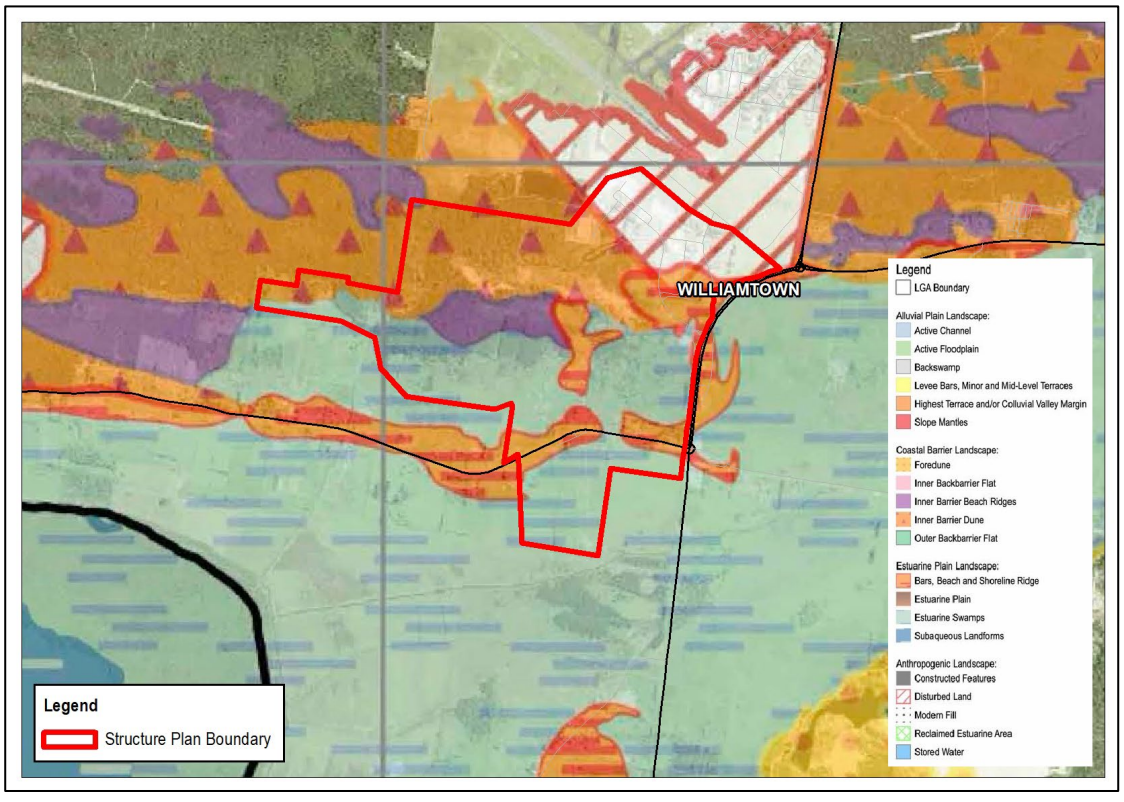



Figure 6.3 Archaeological sensitivity map highlighting the SAP boundary (Mitchell, Lillis & Virtus Heritage, in prep)



In terms of archaeological sensitivity within the SAP boundary, Mitchell, Lillis & Virtus Heritage (in prep) identified and confirmed previously identified landform potential as follows:

Estuarine swamps (inter-barrier depression) have moderate archaeological potential along the interface with the dunes, or margins of the swamps (dunes overlooking the swamp). This is due to the fact that the swamp (inter-barrier depression) was a very important food and fibre resource and evidence of the use of this rich resource is found along its margins (middens, artefact scatters, scar trees, burials, hearths, knapping floors etc.), (Mitchell, Lillis & Virtus Heritage, in prep, 82-85). Whilst not actually camping in the swamp itself, swamp lands are known for soils that may allow for the preservation of organic materials such as wooden tools, fibre nets etc. However, predicting where such materials may be located within the swamp area is problematic, especially as this environment has undergone significant natural and anthropogenic changes and as such implements would not have been deliberately buried in the swamp, but rather accidently left behind or discarded with no pattern of discard across the area.

The Inner barrier dune system was identified as being of low to moderate archaeological potential, (Mitchell, Lillis & Virtus Heritage, in prep, 82-85). However, as this landform borders and is the interface with the swamp and numerous sites have been identified in this landform, this area should be considered to be of high archaeological potential, at least along its margins with the swamp and for at least 100 metres away from the swamp.

A small area of the Inner Barrier Beach Ridges is located in the north between the swamp and Inner Barrier dune as well as the far north and has been identified as being of low archaeological potential, (Mitchell, Lillis & Virtus Heritage, in prep, 82-85). However, at some locations this landform borders and is the interface with the swamp and as such should be considered to be of high archaeological potential, at least along its margins with the swamp and for at least 100 metres away from the swamp.

In addition to the above large studies, a series of archaeological investigations within the Stockton Bight area (e.g. Comber 1991; Smith 1987; Brayshaw 1989, 1990a, b; Dean-Jones 1990; Evans 1993; Effenberger 1996; ERM 1998, 2005a, b, 2010; RPS 2010a, b; Resource Planning 1991a,b, 1992; Sullivan 1978; Umwelt 2000, 2003, 2011a, b; MCH 2003, 2004 a-c, 2005, 2009, 2010a, b, 2011, 2012 a - c, 2015 a – c, 2017, 2018, 2019) have addressed the patterning of archaeological sites within the region, which is acknowledged to be of high archaeological sensitivity and significance. The area of Stockton Bight especially the Fern Bay and Stockton localities, would have provided access to both marine and estuarine subsistence resources. This area was an extremely rich resource zone, providing access to marine, estuarine and wetland resources in the immediate vicinity. In addition, the botanical resources of the Bight include numerous species known to have been valued by Aboriginal groups as food sources. In such a locality, the archaeological record of Aboriginal occupation is complex and extensive across the landscape with interlinking sites that include shell middens, ceremonial grounds, meeting places, camping, men's and women's site, to name a few. A number of archaeological sites are known to occur within the stable dune system of the Bight, the majority of which appear to be small, surface scatters of midden materials including shell, bone and stone artefacts. Site frequency and density appears to increase in associated with wetlands and their subsistence resource, with several large, complex archaeological sites present adjacent to wetlands of the interbarrier depression, between Fullerton Cove and Tillingerry Creek.

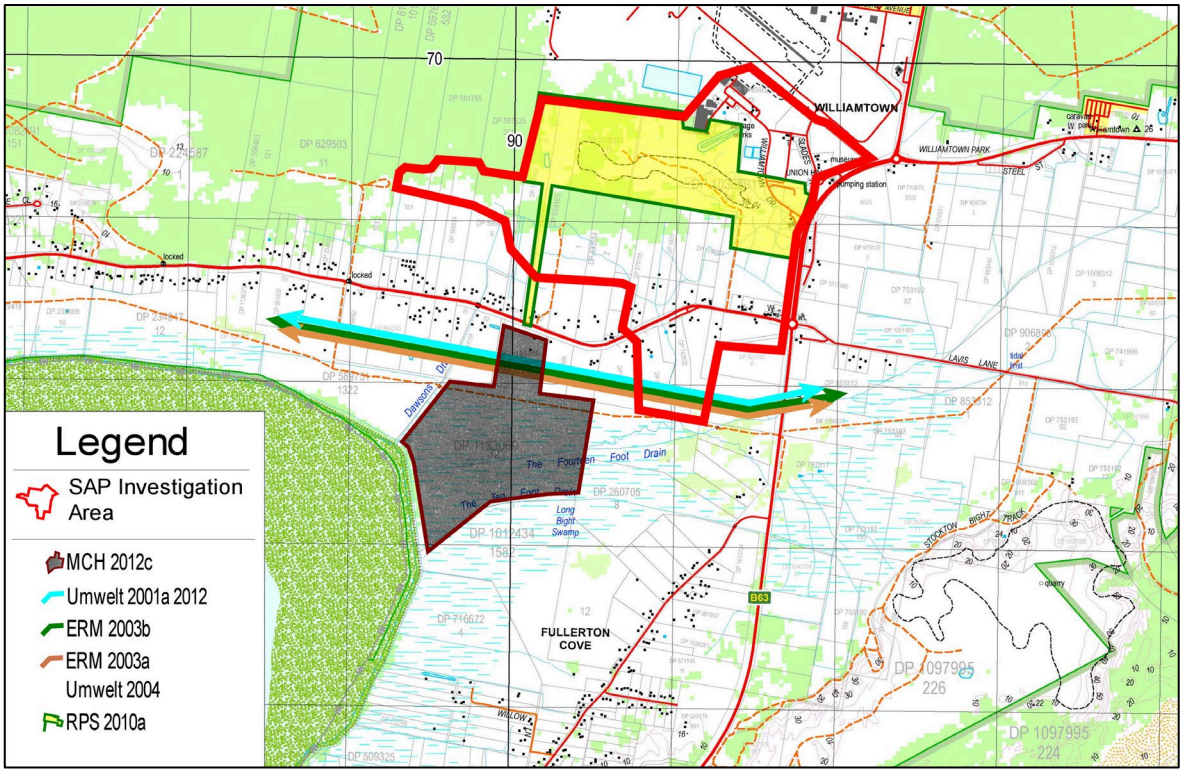
Previous archaeological investigations conducted within the region have produced a significant volume of information in relation to the distribution and nature of archaeological material within this region. These previous assessments have been summarised and presented in Appendix C and on the basis of this information, a number of trends can be identified as follows.

- The majority of sites within the region consist of shell middens (containing beach and/or estuarine species) and stone artefact scatters, with sites varying from single artefacts to dense concentrations of material in both a surface and sub-surface context.
- Other site types occur including a significant number of burials (usually exposed through erosion), scar trees and ceremonial sites.
- Within the stabilised dune fields, it is suggested that greater concentrations of archaeological material (in terms of site numbers and artefact densities) are located on low ridgelines, spurs and low dunes associated with wetland resources overlooking the interbarrier depression.
- Areas at the interface of the swamps (inter-barrier depression) and dunes overlooking the swamp have high archaeological potential due to the fact that the swamp (inter-barrier depression) was a very important food and fibre resource.
- Archaeological material within the active transgressive dune field and current deflation basin primarily consists of exposed and/or deflated deposits that were once associated with former stabilised surfaces and periods of stabilisation. Although some archaeological material may have been deposited during periods of instability (i.e. not in association with a stabile soil surface), this material is likely to have been limited in both extent and distribution.
- Access area between the ocean and swamp area were not suitable for more than transitory activities such as hunting and gathering, travel between resource rich environments with possible overnight camping due to the distance from the aquatic and estuarine resources.
- Due to vegetation coverage and the nature of sand deposits, the detection of sites is directly related to levels of exposure and visibility. Sub-surface deposits may be at a considerable depth below the current dune surface and therefore are unlikely to be detectable unless significant disturbance has occurred.

### 6.2.1 PREVIOUS ASSESSMENTS WITHIN THE SAP BOUNDARY

Seven investigations have been undertaken within the Williamtown SAP boundary (ERM 2003a, b; Umwelt 2011a, 2012, 2014; RPS 2010), (Figure 6.5). The ERM and Umwelt studies relate to the Tomago to Tomaree Power Line, and the RPS assessment relates to the Aerolab investigation. These are discussed in detail below.

Figure 6.5 Previous assessments within the SAP boundary




**ERM. 2003a. Electricity Supply Upgrade from Tomago to Tomaree. Indigenous Cultural Heritage Assessment. Report to EnergyAustralia**.

ERM (2003a) undertook an identification of impacts in relation to known and recorded archaeological sites as part of an Environmental Impact Statement (EIS) for EnergyAustralia. This covered the proposed upgrading of electricity powerlines from Tomago to Tomaree and on the associated access road from Salt Ash to Tomaree. Various vegetation communities were identified along the proposed routes, including apple-blackbutt, bitou bush, swamp mahogany, broad-leafed paperbark, sedges, swamp oak, salt water couch, melaleuca, casuarina, hakia, banksia, stunted red bloodwood, smooth-barked apple, kikuyu, grasses, purpletop, blackberry, fireweed, dock and bracken. The main water sources in the area were Tillegerry Creek and Fullerton Cove. Past land uses included clearing, agriculture, horse and cattle grazing and breeding, deer farms, hobby farms, mining and quarrying. The Tomaree National Park also stretched along the coastline from Tomaree Head, south to Anna Bay. Based on a review of past studies in the area and a search of the NSW NPWS Aboriginal Sites Register a predictive model was compiled. It was predicted that campsites may occur in the area with hearths and/or artefact scatters containing stone and shell. Other site types predicted to possibly occur included scarred/carved trees, middens and burials. Scarred/carved trees were predicted to occur where clearing had not occurred. Although the presence of burials in the area could not be dismissed it was predicted that the likelihood of discovering any was minimal. The predictive model proved accurate as a mix of artefact scatter/isolated find and midden sites were located. The survey was broken up into geomorphological land forms, consisting of Pleistocene Dunes, Inter barrier depression and the Holocene Dunes. Ten new sites were identified and are summarised in Table 6.2.

Table 6.2 Summary of sites (ERM 2003a)

| Site Name | Site type | Landform | Distance to Water | Stream Order | Artefacts/ Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| 38-4-0647 (A1) | artefact scatter/ midden | dune slope | 6m | swamp | 29 microliths, cockle/ oyster/pipi | clearing, grazing and easement | moderate to high |
| 38-4-0648 (A2) | artefact scatter/ midden | dune slope | 5m | swamp | 3artefacts, cockle, oyster/pipi | cattle grazing and easement | moderate |
| 38-4-0649 (A3) | artefact scatter/ midden | hill slope | not noted | not noted | artefacts and shell | easement, access track, path, grazing | moderate |
| 38-4-0643 (A4) | artefact scatter/ midden | dune crest/dune slope | not noted | not noted | 115 artefacts, shell, bone | easement and grazing | high |
| 38-4-0650 (A5) | midden / artefact scatter | Dune | 600m | swamp/lagoon | artefacts, shell | driveway and power poles | high |
| 38-4-0651 (A6) | midden | dune crest | not noted | not noted | various shells | access road, WWII tank traps | moderate |
| 38-4-0652 (A7) | midden | dune crest | not noted | not noted | various shells | access road, WWII tank traps | moderate |
| 38-4-0653 (A8) | midden | not noted | not noted | not noted | various shells | erosion | moderate |
| 38-4-0664 (A9) | isolated find/ midden | dune slope | not noted | not noted | broken flake with usewear, shell pieces | erosion, burnt tree | low to moderate |
| 38-4-0676 (A10) | midden / artefact scatter | dune slope | 6m | swamp | 9 artefacts, cockle, mud oyster shell, fish/lizard/ bird, kangaroo bone | agricultural clearing and cattle grazing | moderate to high |

In addition, five previously recorded sites, 38-4-0313, 38-4-0485, 38-4-0658, 38-4-0660 and 38-4-0661 were relocated and seven PADs also identified, two located on the Inner Pleistocene barrier system and five on the Holocene Barrier System. ERM concluded that the proposed works would impact on a number of sites (38-4-0649, 38-4-0650, 38-4-0664) and all the identified PADs. Recommendations included mitigation measures to protect those sites that could be preserved from damage or destruction as a result of the proposed works. It was recommended that EnergyAustralia undertake test excavations on PADs 1 to 7 and that the following sites be fenced with a buffer zone: 38-4-0647, 38-4-0676, 38-4-0664 and 38-4-0643. It was also recommended that sites 38-4-0468 and 38-4-0649 be preserved by the most appropriate method (such as by covering the site with biodegradable netting,

sand and grass). A partial consent to destroy permit was recommended for 38-4-0650. The following sites were recommended for both fencing and conservation through methods such as biodegradable netting, sand and grass coverings: 38-4-0659, 38-4-0660, 38-4-0661, 38-4-0313 and 38-4-0485.

**ERM. 2003b. Electricity Supply Access Road – Tomago to Salt Ash. Indigenous Cultural Heritage Assessment. Report to EnergyAustralia.**

ERM (2003b) undertook an archaeological assessment for a proposed access road from Tomago to Salt Ash. The general route of the road was known at the time of investigation, but the exact location was subject to change necessitating that the survey included a number of alternative routes. The study area included areas from the existing Tomago substation and extended east through the Pleistocene dunes, the Inter Barrier depression, the Holocene dunes and ended at Salt Ash. EnergyAustralia proposed to construct a 5m wide continuous road along the route, running to a length of approximately 16km. Access points from the road to each pole for substation line construction and maintenance were also required. Other proposed works included laying geotextile fabric, laying car and truck tyres, filling and capping with crushed rock/recycled concrete, depositing sand and spreading grass seed. The proposed access road was predominantly placed through disturbed pasture grassland, containing kikuyu, couch, dock, blackberry, fireweed and purpletop. Other vegetation was noted in occasional patches and included: swamp oak, salt water couch, sedges, smooth-barked apple, blackbutt, red bloodwood, bracken fern and wallum banksia. Lantana was noted in some areas, and alligator weed infestations were noted in association with drainage lines. The main water sources were Tillegerry Creek and Fullerton Cove with a series of floodgates, tidal flaps, drains and levees occurring along the drainage network. Past disturbances included agriculture, horse and cattle grazing and breeding, deer farms, hobby farms and residential development. A search was undertaken of the NPWS AHIMS register, showing 91 Aboriginal sites to have been registered within the Tomaree peninsula. These included 54 middens, 26 open campsites, five scarred trees, one burial, one shelter with art, one shelter with midden and three isolated finds. Seven middens and eight sites recorded by ERM in 2002 (not yet on the AHIMS register) were also taken into consideration. A predictive model was compiled based on previous heritage studies and the AHIMS results. The predictive model stated that the site types most likely to occur throughout the Pleistocene and Holocene portions of the study area were campsites, scarred trees, middens and burials. The most likely types were middens and campsites; burials were considered unlikely and scarred trees were only possible in areas that had not been cleared. No sites were expected to be found in the interbarrier depression portion of the study area. A total of six sites were recorded on the survey, two of which (A2 and A4) were avoided on the final route for the proposed road. The predictive model proved accurate as the site types encountered were all artefact scatter/isolated find and midden sites. The sites that were identified included those previously identified during the ERM 2003a assessment (Table 5.2 above). In addition, one PAD was also identified on the inner Pleistocene dune. ERM concluded that the proposed development would involve minimal changes to the current landscape. The proposed works would avoid sites A2 and A4; PAD1 and part of A3 and A9 would be impacted by construction and maintenance. Sites A1 and A10 were to be protected. Recommendations included subsurface testing in PAD1, fencing sites A1, A3, A4, A9 and A10 including a buffer for their protection. A partial consent to destroy was recommended to cover those areas of A3 and A9 that would be affected by construction.

**Umwelt (Australia) Pty Ltd. 2004. Research Design and Methodology to Accompany DEC Section 87 and Section 90 Permit Applications for Stage 2 Investigations and Site Conservation Works for the Tomago to Tomaree Electricity Supply Upgrade Project. Report to EnergyAustralia.**

Umwelt (Australia) Pty Ltd (2004) compiled a Research Design and Methodology report that related to five sites and four PADs identified by ERM in 2003 in relation to the Tomago to Tomaree Electricity Supply Upgrade project. In addition to the sites and areas of PAD, this report also referred to three areas along Nelson Bay Road which had mounds of shell material removed by the RTA during road works from 10 sites located in that area. The shell material removal was undertaken in consultation with Worimi Local Aboriginal Land Council and NPWS Aboriginal Sites Officers; these works resulted in the collection of very small amounts of shell material. All of the sites/PADs and shell mounds were located within the Outer Holocene Barrier System, situated between Tomago and Tomaree. The Research Design also extended to three sites and a PAD that had been previously investigated and salvaged, located within the Inner Pleistocene Barrier System at the western end of an easement that was due to be impacted by Stage 1 of the proposed project. It was proposed as part of Stage 2 to undertake conservation works to protect and conserve part of Site A3 (#38-4-0649) and Boyces Track 1, and to conserve all of Sites A4 (#38-4-0643), A5 (#38-4-0650) and A9 (#38-4-0664). Conservation works were further planned for the three areas where shell material was pushed into mounds on the southern side of Nelson Bay Road. Subsurface salvage was proposed for Sites A3 and Boyces Track 1 and subsurface investigations recommended for various pole locations throughout locations PAD3 and PAD4. The purpose of these investigations was cited as being to identify if artefactual material existed in these areas and what the Aboriginal and archaeological significance of that material (if any) might be. The project area was within the Newcastle Bight Sand Barrier System, including an Inner Pleistocene Barrier System, an Outer Holocene Barrier System and an Interbarrier Depression. Inland dunes were noted to have been stabilised with vegetation, with coastal dunes remaining destabilised and transgressive. The Interbarrier Depression divided the barrier systems and at the time of the inspection was filled with estuarine and freshwater deposits. The geology of the area consisted of sands, silts and clays. To the southwest the Quaternary deposits were underlain by tuff, shale, conglomerate, sandstone, and coal. Vegetation in the areas of low gradient shoreline had been extensively cleared for cattle grazing and at the time of inspection were covered with couch grass, vegetation in the interbarrier depression area included stands of swamp oak, tea-tree, water ribbons, spike rush, sword-sedge and bulrush. The Outer Holocene dune system contained a Coastal Sand Apple-Blackbutt Forest with tea-tree, bracken fern, running postman, banksia, kangaroo grass, flax lily, native cherry and bungwall. This report did not conduct an AHIMS search as the intention of the report was to provide a research design and methodology for an existing area containing known sites. The previously recorded sites whose research design and methodology were detailed in this report included the following: A3 #38-4-0469 (incorporating PAD2); A4 # 38-4-0643; A9 # 38-4-0664; A5 #38-4-0650; PAD3; Boyces Track 1; PAD4 (western end); PAD4 (eastern end); #38-4-0402; #38-4-0478; #38-4-0479; #38-4-0480; #38-4-0481; #38-4-0483; #38-4-0484; #38-4-0485; #38-4-0491; 38-4-0492; PAD5 and Stored Shell Material.

The research design attempted to focus on questions of interest to the Aboriginal community, aimed toward supporting oral history in relation to how Aboriginal people used the Pleistocene and Holocene Barrier Systems. The research design related to the broader research parameters of the entire salvage/investigation program, and asked such questions as what resources were available in the area, what resources were transported in and from where, how stone artefact/shellfish/faunal assemblages differed between the Inner Pleistocene Barrier System and the Outer Holocene Barrier System, what tasks were undertaken at the sites, were areas used at different times of the year, was heat treating taking place, were burials in either area and were Aboriginal people using the Inner

Pleistocene Barrier System in the Tomago area earlier than the mid to late Holocene? Methodology was tailored to each site location and included such works as implementing an access road atop the ground surface to avoid subsurface impacts, undertaking subsurface investigation in pole location areas excavated in squares either stratigraphically or in 5cm spits with all material sieved through a 2mm mesh. A full analysis of stone material was to be undertaken for any artefacts located during these works. Detailed site recordings were also to be undertaken and in areas where sites could be avoided, they were in some cases to be fenced for protection. Surface collection and subsurface salvage were to be used as a consistent approach to numerous locations in the areas of impact. Protection of shell mounds was to be undertaken by covering them with mulch derived from the vegetation clearance and temporarily fenced for the period of pole emplacement. Following the completion of the Stage 2 salvage and conservation works, it was proposed that DEC be informed and a single report be produced to cover the results of Stage 1, 2 and possibly 3 of the investigation and salvage work. As this report detailed the research design and methodology only, the results of these proposed works are included in a separate report.

**Umwelt. 2011a. Research Design and Methodology to accompany an Aboriginal Heritage Impact Permit Application for Sub-Surface Investigations, Tomago, NSW. Report prepared for EnergyAustralia.**

Umwelt (2011) completed an AHIP application in relation the proposed 33 kV overhead sub-transmission line (feeder) stretching between Tomago and Williamtown. Past impacts in the study area included vegetation clearance, excavation and fill deposition. The topography of the study area consisted of the large Stockton Bight dual barrier formation, comprising a Holocene age seaward barrier and low swampy depressions. The underlying geology consisted of Tomago Coal Measures which included tuff. A known high-quality tuff outcrop utilised for tool manufacture was 12 kilometres away at Nobbys Head, while another known tuff quarry site was at Shortland, situated 11 kilometres away. The beach area containing the three sites and area of PAD was largely devoid of vegetation, but the immediately surrounding area contained multiple floral resources. Some vegetation types included mat-rush, banksia, sword sedge, bungwahl, bracken fern, water ribbons and tea-tree, as well as eucalypts and native grasses. The available resources of the past are likely to have provided use for food, material and medicinal purposes. Water sources in the surrounding area included Grahamstown Swamp and the Hunter River. A search of the AHIMS register identified 19 sites in the surrounding area. A previous assessment by Umwelt identified that the majority of the proposed alignment had low potential to impact Aboriginal cultural heritage values, objects or deposits and was therefore not recommended for any constraints. The western end of the alignment, however, contained one area of Potential Archaeological Deposit (PAD) as well as three previously registered AHIMS sites, being A1 (#38-4-0647), A2 (#38-4-0648) and A3 (#38-4-0676). As there was a high likelihood that the proposed works would impact on these sites an AHIP application was recommended. As the major ground impacts associated with the proposed works consisted of excavation at each of the power pole locations, a pedestrian survey to inspect each of the proposed locations along the route was undertaken during August 2010. No new sites or surface material pertaining to the previously registered sites was identified and RPS noted that ground vegetation cover lowered the surface visibility at this time. A test excavation program was recommended to determine the subsurface content at each of the proposed pole locations. It was proposed that a two metre by two metre area be excavated at each of the proposed pole locations and that surface collection be undertaken for any objects identified during the testing works. Management procedures were cited by the discovery of hearths and skeletal material and it was recommended that all workers and contractors for the pole construction be made aware of the legislative requirements for protecting cultural heritage during works. The proposed research design included such questions as what resources were available in the past, how they were transported, how

landscape use varied by place, time and activity, and what differences there were between Holocene assemblages and Pleistocene assemblages. It was proposed that any salvaged artefacts be reburied at an appropriate and safe location, following stone tool analysis.

**Umwelt Australia Pty Ltd. 2012. Report on salvage works conducted under AHIP #3382, Tomago, NSW. Report prepared for Ausgrid.**

Umwelt (2012) undertook a surface collection and salvage excavations at specific locations within a previously recorded site and PAD within the Tomago to Williamtown power line project area. These works were to be undertaken in proposed areas of impact for a new 33 kilovolt (kV) feeder extending from Tomago to Williamtown, north of Newcastle, NSW. These works were undertaken under the conditions of Aboriginal Heritage Impact Permit (AHIP) #3382. The topography of the study area consisted of a slope within a large dual barrier formation known as Stockton Bight. Stockton Bight was composed of an inner barrier of Pleistocene age (referred to as the Inner Barrier), a seaward barrier of Holocene age (referred to as the Outer Barrier) and a low-lying swampy depression that divided the barriers and was known as the Inter-Barrier depression. In the Aboriginal past the closest water source would have been a large estuarine swamp containing pockets of freshwater swamps, with other swampy areas surrounding. The beach ridge and dune formation would have also hosted a variety of vegetation, which had since been cleared. A past assessment had three identified sites A1 (#38-4-0647), A2 (#38-4-0648) and A10 (#38-4-0676) and an area of Potential Archaeological Deposit (PAD1 - #38-4-0679) in the study area. This report detailed the results of salvage works at these locations. No surface artefacts were located in the study areas so surface collection was not undertaken. Excavations were conducted at proposed pole locations, each marked out as a two metre by two metre square, divided into four one by one metre squares, and further subdivided into four quadrants of 50 centimetres by 50 centimetres. All excavated material was passed through a three-millimetre gauge sieve. The salvaged assemblage consisted of only 10 artefacts. All artefacts were manufactured from Nobbys tuff and were predominantly broken flakes, with four complete flakes and one flaked piece. Of the complete flakes, the largest flake exhibited signs of use on its distal margin. The artefacts were all relatively small and did not include any formal tool types such as geometric microliths. Umwelt recommended the artefacts be reburied following the completion of the proposed works, in accordance with Requirement 26 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.

**RPS. 2010a. Aboriginal Archaeological Excavation Works Stage 2 AHIP #3 157-1 I 01504 Williamtown Aerospace Park. Report prepared for Williamtown Aerospace Park.**

RPS (2010) completed an archaeological test excavation and surface collection of Stage 2 sites covered in the Aboriginal Heritage Impact Permit #3157-1101504. The investigation area was located about 15 kilometres to the north-east of Newcastle, on the western side of Nelson Bay Road in Williamtown within Lot 11 DP 1036501. Past impacts in the investigation area included sand mining. Landforms across the investigation area consisted of dunes and foreshore area, being predominantly situated both on the Inter-Barrier Depression and on a portion of remnant sand dune which formed part of the Newcastle Bight sand barrier system. The investigation area was situated on the Tomago Sandbeds, which derived from Holocene and Pleistocene Aeolian and marine sand deposits. The deposits had been extensively reworked to form dune systems and sand sheets of Quaternary sediments, including Aeolian and marine sand deposits as well as silt and clay deposits. A small vegetated sand dune was situated in the area and flora species were recorded from nine vegetation communities, being: Coastal Sand Apple-Blackbutt Forest, Coastal Sand Wallum, Coastal Wet Sand Cyperoid Heath, Coastal Wet Sand Cyperoid Heath regrowth, Freshwater Wetland Complex, Scrub - *Leptospermum juniperinum*, Scrub - *Melaleuca ericifolia*, Swamp Mahogany - Paperbark Forest and

Swamp Oak - Rushland Forest. Drainage depressions and heath swamp areas were the main water sources for the area, with the swamplands having supported rich resources. The Research Design and Methodology for the archaeological excavation of the investigation area was developed based on the previous work in the area and discussions with the Aboriginal community. Proposed research questions included discovering if the site extended into the Pleistocene level of the dune, if use wear analysis could indicate resource exploitation and if there were differences in tool reduction processes and raw material uses.

Nine geoarchaeological test pits were excavated as part of the archaeological investigation. Two archaeological test trenches were excavated for the salvage of Aboriginal artefacts and the recording of any relevant features. Test Trench 1 (TT1) excavated six cubic metres of sand/soil material and Test Trench 2 (TT2) excavated two cubic metres of the same. Cultural material was only recovered from TT1, which also contained two Aboriginal hearths, one with charcoal. Radiocarbon dating of the charcoal gave the result of conventional age or percent modern carbon. Surface collection was undertaken at AHIMS sites #38-4-0301 and #38-4-1146. A total of 1695 artefacts were identified through test excavation. This included 1023 angular fragments, 569 flakes, 30 pieces of ochre, 27 tools, 24 manuports and 22 cores. Raw materials used in artefact manufacture included tuff (being the most common), silcrete, Mafic volcanic, quartz, Felsic volcanic, sedimentary and quartzite.

The site did not extend into the Pleistocene dune level. The majority of tools were backed artefacts which did not exhibit signs of use. A total of 89 percent of complete flakes were tuff and 87 percent of backed artefacts were made from tuff. This pattern was assessed as likely due to the higher availability of tuff as an abundant primary source of tuff was available within 13 kilometres of the site. It was concluded that Aboriginal people were utilising the location during the late Holocene period. The high density of artefacts, compact shell deposits and the presence of two hearths indicated intensive use over a period of time. However, the small amounts of food resource material (shell and bone) recovered indicated that the site was not inhabited for an extended period. It was concluded as unlikely that large numbers of Aboriginal people had used the site. It was stated that no further archaeological work was required in the investigation area. All land within the investigation area had been subject to previous archaeological surveys, a surface collection programme of AHIMS sites #38-4-0301 and #38-4-1146 and archaeological test excavation (although none of these reports were listed on AHIMS).

RPS recommended that an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the National Parks and Wildlife Act (1974, as amended) should be sought in order to allow future proposed works to go ahead. All relevant staff and contractors should be made aware of their statutory obligations for heritage and if Aboriginal site/s are identified, the site Project Manager is to contact RPS and the relevant Aboriginal stakeholders so they can adequately assess and manage the site. Finally, that in the unlikely event that skeletal remains are identified, work must cease immediately and appropriate assessment be undertaken.

### 6.2.2 AHIMS SITES WITHIN THE SAP BOUNDARY

As illustrated in Figure 6.6, there are six AHIMS sites within the SAP boundary and include four artefact sites, one artefact and hearth and PAD site, and one artefact and burial site.

Figure 6.6 AHIMS sites within the SAP boundary

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**38-4-2005 artefact site with hearth and PAD:** The AHIMS site card is not available, however, AHIMS provided data states that this is an artefact site with hearth and potential archaeological deposit.

**38-4-1157 (artefact scatter):** located on the crest of a stabilised dune system and adjacent to the interbarrier depression, this site consisted of three stone artefacts (one tuff flake, one tuff flake piece and one tuff core). RPS recorded this site in 2009 and noted that the land had been used for cattle grazing only.

**38-4-1146 artefact site:** The AHIMS site card is not available, however, AHIMS provided their data sheet for this site. The AHIMS data sheet state that this is an artefact site

**37-6-4173 artefact site.**

**38-4-0301 shell midden with artefacts:** Recorded in 1990 by Dean-Jones as part of the Newcastle Bight Aboriginal Sites Study, this site was located on the crest and upper slopes of a Pleistocene transgressive dune. The site exposure was approximately 100m x 60m with over 1000 visible artefacts eroding downslope and in situ. Artefacts included backed artefacts and blades and there was a very low density of shell along the dune crest (pipi). Surface visibility was 100%

**38-4-0053 shell midden with artefacts and skeletal remains:** Recorded by Dyall in 1975, the AHIMS site card first records the presence of shell eroding form the top of a spoil pits that was dug out around 1942 for the construction of the air base runways. Oyster and mud whelk as well as 3 chert flakes, 2 flake cores and 25 waste flakes od various raw materials were recovered. It appears that additional artefacts were recovered also in 1975 and included 3 backed blades and about 50 waste flakes. The site card also included information regarding an Aboriginal skull being identified and transferred to Glebe Forensic Medicine. The original location of the skull was unknown and the area had since been totally cleared, levelled and transformed into a grassed area for management purposes (works complete in 1979).

## 6.3 LOCAL & REGIONAL CHARACTER OF ABORIGINAL LAND USE & ITS MATERIAL TRACES

The following is a summary and discussion of previous investigations detailed in *Section 5.2*. It must be remembered, however, that there are various factors which will have skewed the results. These include but are not limited to:

- the landform on which a site area is observed is not necessarily its origin, for example, artefacts which would have originated on a crest may be located eroding down the slope;
- biases due to differential sampling of landforms based on decisions made by archaeologists and as a result of restrictions due to the locations of proposed development areas, levels of exposure on different landforms, and the variable level of reporting by archaeologists will affect the count of sites on each landform type, and
- artefact counts can be skewed due to factors such as differing levels of fragmentation of material and levels of ground surface visibility. A very large number of sites/ artefacts were located on exposures with either no or very few artefacts visible away from the exposures.

Therefore, the following summary provides an indication of what may be expected in terms of site location and distribution. The local archaeology of the area can be summarised as follows:

- sites are generally within 50 metres of reliable water;
- sites are located on both the Holocene and Pleistocene dunes overlooking the interbarrier depression;
- sites are not usually found in the interbarrier depression;
- there is a decrease in site numbers and site densities between the Inner Holocene dunes and the beach front;
- site types are typically shell middens with various shell species, stone tools and may also contain charcoal, fish and animal bone;
- artefact scatters, isolated finds, scarred trees, burials and ceremonial sites may also be found along the dunes;
- artefacts typically date to the Holocene but Pleistocene sites may be present in the Pleistocene dues;
- raw materials are tuff obtained locally and/or silcrete, chert or quartz that have been traded/transported from the Hunter Valley area;
- stone artefacts are typically flakes, flake pieces, broken flakes, cores and tools with fish hooks manufactured form local shell.

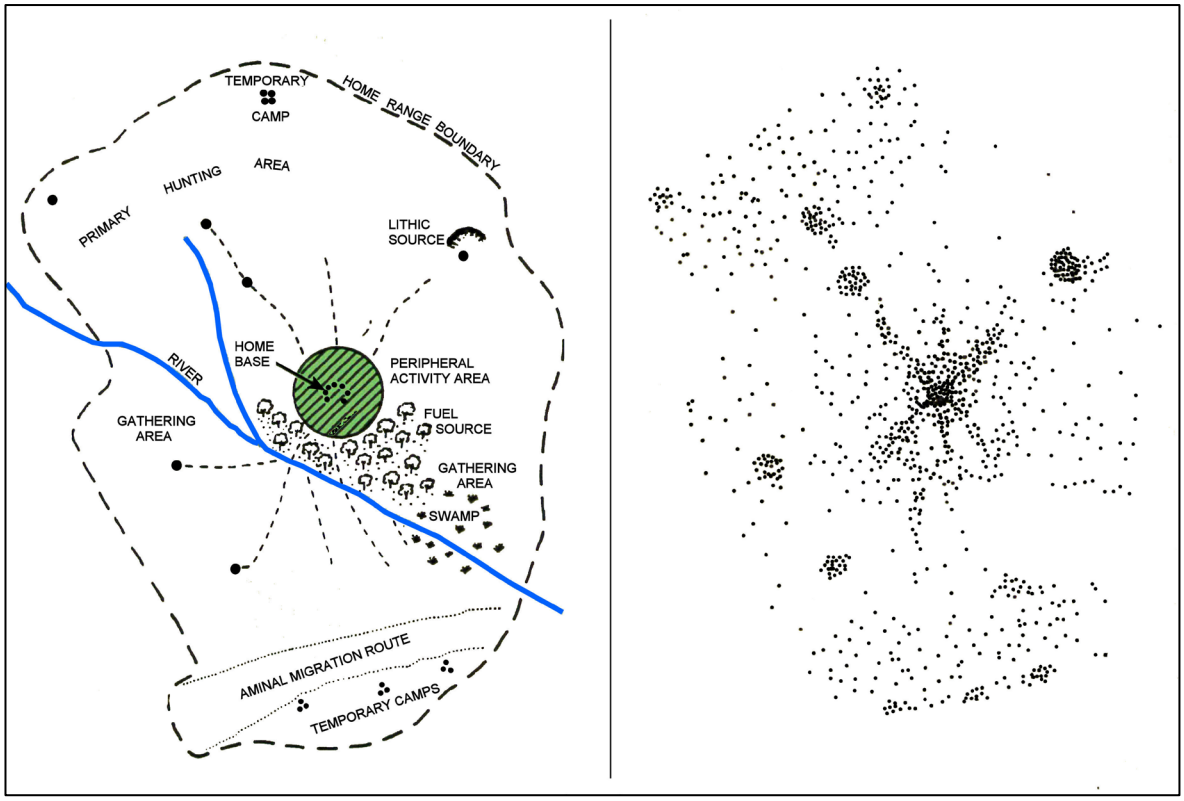
Variations between archaeologists' classifications of raw material types (for example tuff and indurated mudstone) will have an effect on the results of this count. Raw material type was not indicated in most reports and as such general comments are made. Again, this information is presented merely as an indication of what may be expected.

Due to differences in recording techniques, it is difficult to determine how many of each artefact type is represented across the region though types include flakes, broken flakes, retouched flakes, multi-platform cores, single platform cores, bipolar cores, flaked pieces, 'waste' pieces, debitage, 'geometric microliths', 'backed blades', 'bondi points', 'scrapers', 'blades', 'hatchets', edge-ground axes, anvils, hammer stones and heat. Due to variations in both the amount of data that is included in reports, and the terms different archaeologists used to describe artefact types, it is not practicable to provide a count of the different artefact types.

## 6.4 MODELS OF PAST ABORIGINAL LAND USE

The main aim of this project is to attempt to define both the nature and extent of occupation across the SAP boundary. As a result, the nature of the analysis will focus on both the landform units and sites. The purpose of this strategy is to highlight any variations between sites and associated assemblages, landforms and resources across the area treating assemblages as a continuous scatter of cultural material across the landscape. In doing this, it is possible to identify variation across the landscape, landforms and assemblages that correspond with variation in the general patterns of landscape use and occupation. Thus, the nature of activities and occupation can be identified through the analysis of stone artefact distributions across a landscape. A general model of forager settlement patterning in the archaeological record has been established by Foley (1981). This model distinguishes the residential 'home base' site with peripheral 'activity locations'. Basically, the home base is the focus of attention and many activities and the activity locations are situated away from the home base and are the focus of specific activities (such as tool manufacturing). This pattern is illustrated in Figure 6.7. Home base sites generally occur in areas with good access to a wide range of resources (reliable water, raw materials etc.). The degree of environmental reliability, such as reliable water and subsistence resources, may influence the rate of return to sites and hence the complexity of evidence. Home base sites generally show a greater diversity of artefacts and raw material types (which represent a greater array of activities performed at the site and immediate area). Activity locations occur within the foraging radius of a home base camp (approximately 10 km); (Renfrew and Bahn 1991). Based on the premise that these sites served as a focus of a specific activity, they will show a low diversity in artefacts and are not likely to contain features reflecting a base camp (such as hearths). However, it is also possible that the location of certain activities cannot be predicted or identified, adding to the increased dispersal of cultural material across the landscape. If people were opting to carry stone tools during hunting and gathering journeys throughout the area rather than manufacturing tools at task locations, an increased number of used tools should be recovered from low density and dispersed assemblages.

Figure 6.7 Foley's model (L) and its manifestation in the archaeological record (R), (Foley 1981).




### 6.4.1 MODEL OF OCCUPATION FOR THE HUNTER VALLEY

Work in the Hunter Valley has aimed to understand the nature of Aboriginal occupation and determine the nature of land use. This theme often aims to identify and explain archaeological patterning in site type, content and distribution. General theories have been developed outlining the relationship between land use patterns and the resulting archaeological evidence. A number of models developed for the Hunter Valley have been reviewed (Dean-Jones and Mitchell 1993; Rich 1995; Kuskie and Kamminga 2000) and the most commonly accepted model is summarised below.

Kuskie and Kamminga (2000) established a general model of occupation strategies based primarily upon ethnographic research. Used as a starting point, it makes a general set of predictions for the Hunter that is consistent with other studies (e.g., Nelson 1991). The model distinguishes between short-term or extended long-term occupation and makes some predictions about the likely location of different foraging and settlement activities. Combining this information with a general review of assemblage contents from a sample of excavated sites within the Hunter Valley, a baseline of settlement activities may be determined (Barton 2001). The model provides a number of archaeological expectations that may be tested. For example, the presence of features requiring a considerable labour investment such as stone-lined ovens or heat-treatment pits are likely to occur at places where occupation occurred for extended periods of time. The presence of grindstones is also a reliable indicator of low mobility and extended occupation. Seed grinding requires a large investment of time and effort (Cane 1989). In most ethnographic examples, seed grinding is an activity that takes place over an entire day to provide adequate energetic returns (Cane 1989; Edwards and O'Connell 1995).

Where group mobility was high and campsites frequently shifted throughout the landscape, artefact assemblages are not expected to contain elements such as grindstones, heat-treatment pits, ovens and the diversity of implements frequently discarded at places of extended residential occupation. It may also have been the case that the location of particular activities could not be predicted by tool users, adding to the increased low-density scattering of artefacts over the landscape. Also, if individuals were opting to carry a number of stone tools during hunting and gathering activities and maintaining these tools rather than manufacturing new tools at each task location, the ratio of used tools to unworn flakes in these assemblages should be high. Table 6.3 has been adapted from Kuskie and Kamminga (2000). To identify the specific activity areas through analysis of the composition of patterning of lithic assemblages, is utilised. However, this is applied to excavated materials as they provide more realistic data due to the lesser degree of disturbances, removal and breakages.

Table 6.3 Site descriptions (Kuskie & Kamminga 2000).

| Occupation Pattern | Activity Location | Proximity to water | Proximity to food | Archaeological expectations |
|---|---|---|---|---|
| Transitory movement | all landscape zones | not important | not important | • assemblages of low density & diversity<br>• evidence of tool maintenance & repair<br>• evidence for stone knapping |
| Hunting &/or gathering without camping | all landscape zones | not important | near food resources | • assemblages of low density & diversity<br>• evidence of tool maintenance & repair<br>• evidence for stone knapping<br>• high frequency of used tools |
| Camping by small groups | associated with permanent & temporary water | near (within 100m) | near food resources | • assemblages of moderate density & diversity<br>• evidence of tool maintenance & repair<br>• evidence for stone knapping & hearths |
| Nuclear family base camp | level or gently undulating ground | near reliable source (within 50m) | near food resources | • assemblages of high density & diversity<br>• evidence of tool maintenance & repair & casual knapping<br>• evidence for stone knapping<br>• heat treatment pits, stone lined ovens<br>• grindstones |
| Community base camp | level or gently undulating ground | near reliable source (within 50m) | near food resources | • assemblages of high density & diversity<br>• evidence of tool maintenance & repair & casual knapping<br>• evidence for stone knapping<br>• heat treatment pits, stone lined ovens<br>• grindstones & ochre<br>• large area >100sqm + isolated camp sites |

## 6.5 PREDICTIVE MODEL

Due to issues surrounding ground surface visibility and the fact that the distribution of surface archaeological material does not necessarily reflect that of sub-surface deposits, it is essential to establish a predictive model.

Previous archaeological studies undertaken throughout the area along with Worimi traditional knowledge of past Aboriginal land uses, provide a good indication of site types and site patterning in the area. The research has shown that middens with stone implements, and middens with only shell are the most predominate site types. The most common site locations are the seaward margin of active transgressive dunes/active blowouts, Holocene and Pleistocene dunes overlooking the interbarrier depression and areas near water sources as evidenced through archaeological and

landform mapping (Figure 6.8). Predictions about site patterning for the two relevant landforms are discussed below.

Figure 6.8 Approximate location AHIMS sites in relation to broad landforms

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Outer Pleistocene dunes:

There is a high potential for sites on this landform. Sites are predominantly middens (composed of either or both estuarine and marine shell species) and open camps, with a sparse scattering of cultural material along the ridgelines of the dunes and high-density sites situated on low flat ridgelines immediately adjacent to wetlands. It is predicted that ridges on the margins with the interbarrier depression have high archaeological potential.

Interbarrier depression:

The interbarrier depression was an important area for foraging as indicated by the prevalence of sites on the margins of both the Pleistocene and Holocene dune systems overlooking the depression. Although these sites are close to the depression and at its interface with the dunes, they are not located within it. Evidence of occupation within the depression is very limited and consists of a scattering of the remnants of midden between Boyces Track and Uralla (Dean-Jones 1990). The interbarrier depression, once the coastal margin and estuarine swamp, is now covered with Holocene estuarine sand, mud and clay ranging in depth from one to ten metres (Robson et al 1992: 13-19). This area has also been extensively disturbed through ploughing, grazing, road construction and development. It is therefore predicted that there is a very low potential for archaeological sites in this landform.

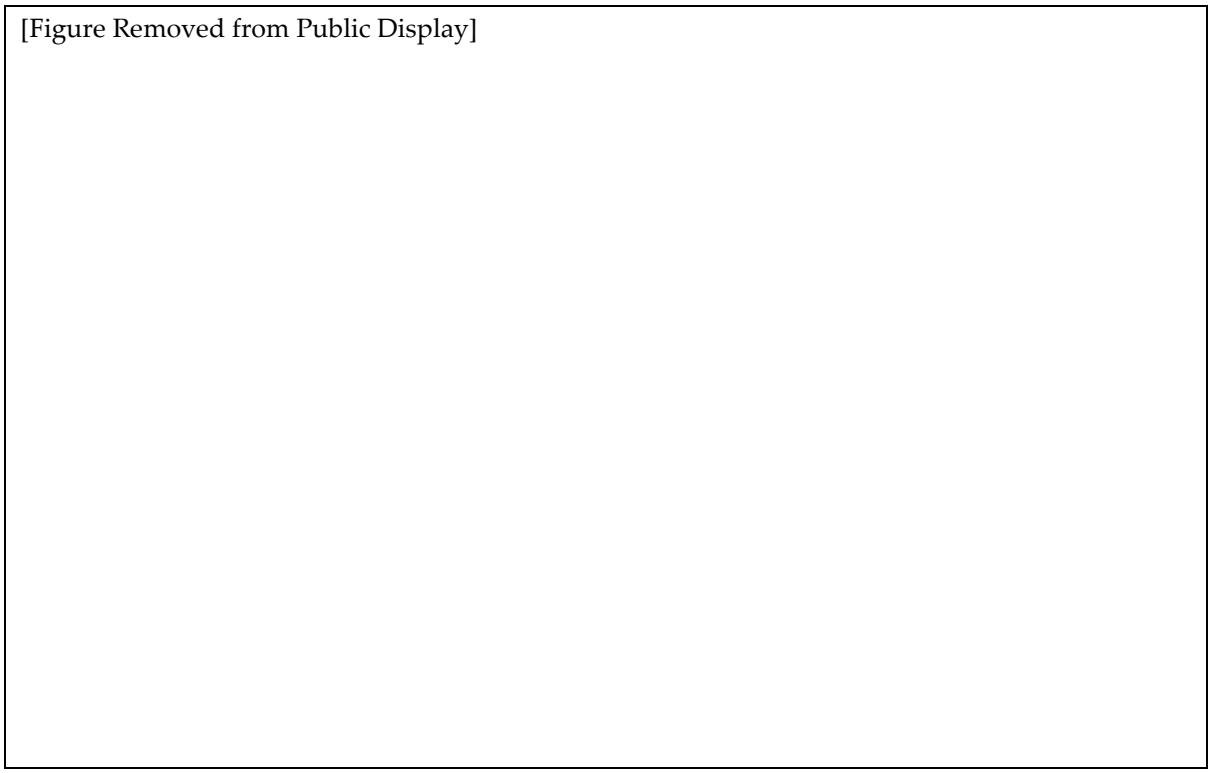
### 6.5.1 PREDICTIVE MODEL FOR THE SAP BOUNDARY

Within the SAP boundary, six AHIMS sites have been identified within the Inner Barrier Dune system, all in close proximity to the interbarrier depression, or swamp lands. Based on the AHIMS sites, past research undertaken throughout the region and locally, as well as the geomorphological

studies and traditional knowledge within the SAP boundary, locations of high cultural and archaeological potential have been identified.

As illustrated in Figure 6.9, the northern portion of the SAP boundary overlooks the swamp lands (inter barrier depression) and includes the interfaces of the swamp lands and dunes that are known to have been favoured for past Aboriginal land uses and camping due to the rich resource of then swamp area and evidence of past Aboriginal land uses and resource exploitation is located throughout this dunal system and typically within 50 metres of the swamp with sites reducing in density away from the swamp but increasing again in close proximity to other fresh water sources. Figure 6.9 is based on the desk top assessment only and may be more defined following any survey that will consider developments, road and other disturbances. Previous investigations have identified that burials are located throughout the dunal system, and as one was previously identified within the SAP boundary, there is a very high potential for additional burials to be located in the dunes.

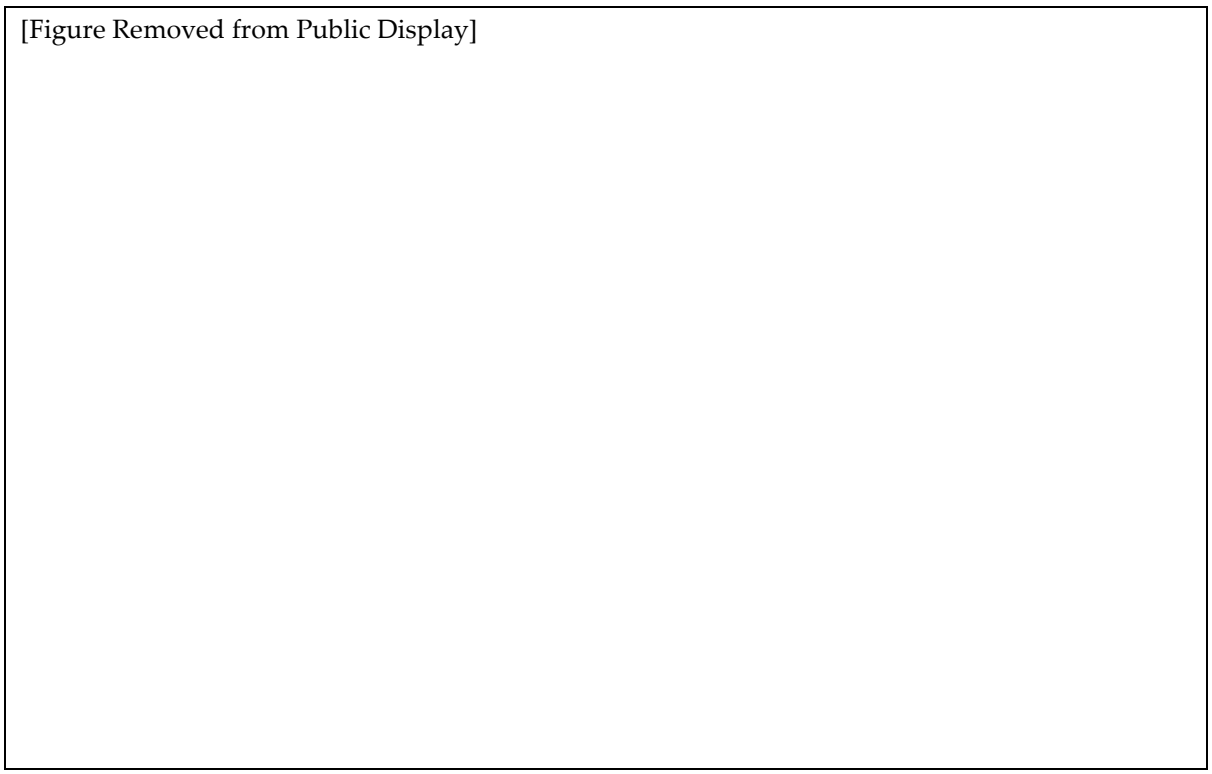
Figure 6.9 Approximate location of AHIMS sites and archaeological potential




Both these landforms are known to contain evidence of open camping with the inclusion of shell middens, artefacts scatters, tool manufacturing and knapping floors, food preparation areas, cooking, as well as burials amongst a range of other site types or activity areas. These locations are also known to be linked to other sites across the landscape in the local area including men's and women's sites, meeting places, ceremonial sites and the Fern Bay site complex, to name a few, have repeated use of the area over extended periods of time. Evidence for multiple sites uses derives from radio carbon dates of an archaeological site along Nelson Bay Rd (on a dune directly long the edge of the interbarrier depression edge) with two distinct levels of occupation identified; one at 541 +/- 20BP and another at 565 +/- 20BP (MCH 2015).

Taking the previous into account and removing obvious land uses (e.g. major developments) and high impacts to the landscape and associated archaeological and cultural record, as well as the very low lying and unsuitable camping area through the southern majority of the SAP boundary (swamp) the area of potential has been reduced to elevated landforms overlooking the interbarrier depression and the interface of these two landforms as illustrated in Figure 6.10 where by large scale excavation construction works have been removed. This mapping may be more defined following any survey that will consider other developments, road and other disturbances.

Figure 6.10 Approximate location of AHIMS sites and archaeological potential with highly disturbed areas and swamp land removed




The accuracy of these predictions would be largely determined by the degree of disturbance. Soil surface disturbance within the SAP boundary means that the extent and spread of surface archaeological material may not reflect sub-surface deposits (it may be more a reflection of differential disturbance and exposure). The refinement of this predictive model will be dependent upon an investigation of the range of landforms and the occurrence of modern disturbances within the SAP boundary, as determined during a comprehensive survey.

## 6.6 ARCHAEOLOGICAL POTENTIAL IN THE SAP BOUNDARY

Based on archaeological sites registered in the region and the results of past archaeological studies, a number of site types are likely to occur throughout the project area:

- **Shell middens**

Shell middens are places where debris from eating shell fish has accumulated. Middens preserve a range of past dietary remains which have the potential to inform about past dietary consumption and availability of food resources. Most shell middens analysed to date pertain to coastal environments with few pertaining to inland middens. In NSW, middens are located on headlands,

beaches and dunes, around estuaries, swamps, the tidal stretches of creeks and rivers and along the banks of inland rivers, creeks and lakes. Shell middens may be found in the open or in rock shelters and often those in the open are disturbed through erosion and land use impacts and those in shelters are usually well preserved. The location of middens is influenced by a variety of factors including, but not limited to, the availability of shell fish, aspect, accessibility and the nature of the immediate area and are typically located within a reasonable distance from water on level, sheltered surfaces.

Ranging in size from small scatters to deep layered deposits that have built up over time, the size of the midden may relate to its location (e.g., riverbank middens tend to be smaller than estuarine and coastal middens). Small middens may represent short term occupation or the debris from a single meal. Major estuarine species include bivalves such as cockle, whelk, mud and rock oyster and both edible and hairy mussels. Rock platform species of gastropods include limpets, turban shell, periwinkles, nerits, tritans and cartrut shell fish and the most important beach species is the pipi.

Shell middens may also include fish, sea birds, sea mammals and land mammals. Stone artefact are also typically found within middens and indicate trade and/or transportation of raw materials. Bone and shell artefacts, such as fish hooks and barbs, evidence of cooking may be present in the form of charcoal, ash, fire stones, hearths, burnt clay and/or burnt earth. The midden usually occurs within a soil or sand layer that is darker than the surrounding sediment. Middens may also contain burials and if present are usually located under the midden.

Preservation varies with food stuffs such as berries and fruits leaving no archaeological traces, sea foods such as cartilaginous fish, stingrays, octopus and fish eggs are likely to be equally invisible in the archaeological record. However, tissue such as shell and crustations and bone may be preserved. Preservation is also dependant on land use impacts and associated soil pH.

An important contribution to the study of coastal shell middens was made by Meehan (1977a, b) through ethnographic studies of coastal hunter and gatherers in northern Arnhem Land. Through a yearlong quantitative record of the total diet, Meehan provides unique insights into all aspects of shell fish gathering and the creation of shell middens with pertinent data to the interpretation of midden data. Shell middens may be distinguished from natural shell beds as follows (Attenbrow 1992; Bailey 1994; Gill 1951; Coutts 1966; Hughes and Sullivan 1974);

1) Middens contain charcoal, burnt wood, clay and/or earth, blackened shells, some artefacts, hearth stones. These are absent from natural shell beds.
2) Middens are either unstratified or roughly stratified whereas natural shell deposits are well stratified and exhibit sedimentary features of water laid deposits.
3) Middens contain edible species and sizes whereas shell beds contain shells of varied species and sizes as well as both edible and non-edible species.
4) Middens do not contain worn shell resulting from transportation from the off shore or beach zone, whereas shell beds do.
5) Middens contain mammal bones used in food consumption, shell beds do not.
6) Middens do not contain certain forms of marine life not used by Aboriginal people (e.g. corals, tube worms) but shell beds do.

Interpretation of shell middens usually falls into three main categories;

1) Taphonomy: differential survival value of different species may be considered.
2) Environmental/ecological: changes in habitat may bring about changes in the availability of species (Coutts 1970).

3) Economic/behavioural: changes in gathering habits brought about by some purely cultural factor may be considered (Bowdler 1970, 1976).

The interpretation of shell middens is only as good as one's analysis, which is only as good as one's sample, all of which are typically limited during surface survey only. Shell middens may represent evidence of

- Large camp sites, where everyday activities such as habitation, maintenance of stone or wooden tools, manufacturing of such tools, management of raw materials, preparation and consumption of food and storage of tools has occurred;
- Medium/small camp sites, where activities such as a small meal was cooked and/or consumed;
- Hunting and/or gathering events;
- Other events spatially separated from a camp site, or
- Transitory movement through the landscape.

Shell middens are a common site type in the locality. There is a high potential for shell middens to occur within the SAP boundary along the dunes overlooking the interbarrier depression. There is also the potential for such sites to be impacted on through past land uses and associated impacts.

- **Artefact scatters**

Also described as open campsites, artefact scatters and open sites, these deposits have been defined at two or more stone artefacts within 50 metres of each other and will include archaeological remains such as stone artefacts and may be found in association with camping where other evidence may be present such as shell, hearths, stone lined fire places and/or heat treatment pits. These sites are usually identified as surface scatters of artefacts in areas where ground surface visibility is increased due to lack of vegetation. Erosion, agricultural activities (such as ploughing, grazing) and access ways can also expose surface campsites. Artefact scatters may represent evidence of;

- Large camp sites, where everyday activities such as habitation, maintenance of stone or wooden tools, manufacturing of such tools, management of raw materials, preparation and consumption of food and storage of tools has occurred;
- Medium/small camp sites, where activities such as minimal tool manufacturing occurred;
- Hunting and/or gathering events;
- Other events spatially separated from a camp site, or
- Transitory movement through the landscape.

Artefact scatters are a common site type in the locality and the broader region. There is a high potential for artefact scatters to occur within the project area along the dunes overlooking the interbarrier depression. There is also the potential for such sites to be impacted on through past land uses and associated impacts.

- **Isolated finds**

Isolated artefacts are usually identified in areas where ground surface visibility is increased due to lack of vegetation. Erosion, agricultural activities (such as ploughing) and access ways can also expose surface artefacts. Isolated finds may represent evidence of;

- Hunting and/or gathering events; or
- Transitory movement through the landscape.

Isolated finds are a common site type in the locality and the broader region. There is potential for isolated artefacts to occur across the project area and across all landforms. There is also the potential for such sites to be impacted on through past impacts including previous clearing and flooding.

- **Burials**

Burials can occur anywhere (ground, cave, and hollow tree). Cave burials usually do not survive due to both animal and human disturbances and extant tree burials are rare due to logging and land clearance. Ground burials tend to be in soft sandy soils, but can be found in soil and clay. Burials are also commonly found in association with burial goods including stone axe heads (Howitt 1996:464-465). Generally, they are only identified through accidental exposure. Although factors such as land clearance and associated erosion reduce the likelihood of burials surviving intact, bone is durable and commonly survives in such environments, albeit in fragmentary form.

In the Port Stephens area, burials are typically under shell middens and may be found in any location and are exposed through erosion and land uses. There is a high number of known burials in the local area and undoubtedly more unfound burials. There is a high potential for burials to be located within the SAP boundary, particularly as one has been previously identified here.

- **Scar trees**

Aboriginal culturally modified (scarred and carved) trees are trees that show the scars caused by the removal of bark or wood for the making of various items. Scars vary in size and are identified by the exposure of the sapwood on the trunk or branch of the tree. Scarred trees often occur along major waterways, around lake margins and flood plains. Bark was removed to make items such as canoes, coolamons, and shields, to construct temporary shelters and coffins and wrappings for the deceased. Wood was also removed for boomerangs, spears, digging sticks, clubs and shields. Toe holds were also cut into trees to gain access to lookout points, possums, bees' nests and bark higher up a tree. The bark was removed by cutting an outline of the desired shape using a stone, trade or steel axe and the bark then levered off. The axe cut marks may remain and be present on the bark or sapwood and may be used to relatively date the scar (pre or post settlement or the contact period) as the different axe types produce different tool marks. However, often the cut marks have been obscured by bark regrowth or thickened bark showing a noticeable lip around the scar and at times closing up leaving a vertical ridge as the only evidence of bark removal. Scarred trees are uncommon due to large scale land clearing, bush fires, insect activity, environmental issues (such as salinity) and decay. Scarred trees are one of the few material clues to the past use of perishable natural resources by past Aboriginal people. Wood and bark items rarely survive and scarred trees are disappearing due to impacts mentioned above.

Other activities that scar trees include survey boundary markers (triangular in shape and may be inscribed), removal for housing materials (usually square or rectangle in shape) and those that border roads may be damaged by traffic and/or farming machinery and damage is usually below two metres in height. Naturally occurring scars also occur through fire, falling limbs and flood debris impacts on trees next to waterways. A scar caused by burning can be identified by the presence of charring, a triangular shape scar, a scar that is wide at the base and tapers up from the ground. Scare caused by falling branches will look like a 'key hole' with the stub of the branch at the top of the scar and a tail of torn sapwood beneath. Scar trees may be identified by the following;

1) A scar will be more-or-less regular shape, will have parallel sides and may have slightly pointed or rounded off ends.
2) The scar will be above ground level.
3) Exposed sapwood will be free of tree knots, branches or evidence of a branch being present at the top of the scar.

4) Exposed sapwood at the base of the scar and more rarely at the tip of the scar may show axe tool marks.
5) The scar tree will be an Australian native species that occurs in the local area.
6) The scarred tree will be over 100 years old.

There are three categories of scarre dtrees;

1) Bark removal (canoes, shields etc)
2) Wood removal (boomerangs, spears, digging sticks, clubs, shields etc)
3) Evidence of hunting or climbing (toe holds: small horizontal scars where the bark is healed over).

Scarred trees may represent evidence of;

- Hunting and/or gathering events;
- Use of the perishable natural environment;
- Long- or short-term occupation of a local, single or multiple occupation events (usually associated with other evidence of camping).

The likelihood of discovering scarred/carved trees in the project area is assessesed as being very low, due to the land use history and natural fires, but cannot be discounted.

## 6.7 HERITAGE REGISTER LISTINGS

The State Heritage Register, the Australian Heritage Database (includes data from the World Heritage List UNESCO, National Heritage List, Commonwealth Heritage List, Register of the National Estate) have no sites listed within the SAP boundary. However, not all Indigenous places are listed, and the Heritage Commission is consulting with Traditional Owners to gradually include indigenous information. The Port Stephens Local Environmental Plan has two sites listed in the LEP including the Stockton Beach Dune System and a Native Flora Reserve that includes a scar tree and burial located at Nelson Bay (Port Stephens LEP Current version for 28 October 2020 to date, accessed 8 November 2020).

# 7 MITIGATION AND MANAGEMENT STRATEGIES

Specific strategies, as outlined through the Heritage NSW, Department of Premier & Cabinet: Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), and the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010c), are considered below for the management of the identified site within the project area. Due to the early stage of the assessment and being an overview without specific development locations identified at this time, a general outline is provided only.

One of the most important considerations in selecting the most suitable and appropriate strategy is the recognition that Aboriginal cultural heritage is very important to the local Aboriginal community. Decisions about the management of sites and potential archaeological deposits should be made in consultation with the appropriate local Aboriginal community.

## 7.1 CONSERVATION/PROTECTION

Heritage NSW, Department of Premier & Cabinet is responsible for the conservation/protection of Indigenous sites and they therefore require good reason for any impact on an Indigenous site. Conservation is the first avenue and is suitable for all sites, especially those considered high archaeological significance and/or cultural significance. Conservation includes the processes of looking after an indigenous site or place so as to retain its cultural significance and are managed in a way that is consistent with the nature of peoples' attachment to them.

At this early stage of the project, conservation/protection of land within the Pleistocene dunal systems should be considered the first option, specifically those locations overlooking the interbarrier depression with reduced land uses and impacts. Survey field work of the SAP boundary will identify any significant sites or places that will require conservation/protection.

## 7.2 FURTHER INVESTIGATION

Due to the known sites and very high likelihood of additional sites throughout the SAP boundary, both surface and subsurface sites, being present within the Pleistocene dunal systems, specifically those areas overlooking the interbarrier depression, additional ACHAs will be required to identify such sites and ensure the appropriate mitigation and management of those sites and potential sites (such as, but not limited to, conservation, test excavation, salvage, community collection). Due to the complexity of both the archaeological and cultural contexts of the region, this assessment should involve a comprehensive archaeological survey to inform any future Development Application, and where areas of PAD are identified subsurface investigations to inform any development approvals to ensure adequate time is provided to ensure suitable outcomes. All ACHA future assessments will be undertaken as per the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010).

These assessments will identify any unrecorded visible sites as well as any areas of potential for subsurface sites (PAD) and provide the appropriate mitigation measures for each site/PAD.

- **38-4-2005 artefact site with hearth and PAD:** The AHIMS site card is not available, however, AHIMS provided data states that this is an artefact site with hearth and potential archaeological deposit and this site will require re-locating and re-recording during the ACHA assessment.

- **38-4-1146 artefact site:** The AHIMS site card is not available, however, AHIMS provided their data sheet for this site. The AHIMS data sheet state that this is an artefact site and this site will require re-locating and re-recording during the ACHA assessment.
- **37-6-4173 artefact site.** This site will require re-locating and re-recording during the ACHA assessment.
- **38-4-1157 (artefact scatter):** located on the crest of a stabilised dune system and adjacent to the interbarrier depression, this site consisted of three stone artefacts (one tuff flake, one tuff flake piece and one tuff core), and this site will require re-locating and re-recording during the ACHA assessment.
- **38-4-0301 shell midden with artefacts:** located on the crest and upper slopes of a Pleistocene transgressive dune, and this site will require re-locating and re-recording during the ACHA assessment.
- **38-4-0053 shell midden with artefacts and skeletal remains:** as this site has been destroyed by early airstrip construction works, no additional investigations are required.

## 7.3 ABORIGINAL CULTURAL HERITAGE MANAGEMENT PLAN

An Aboriginal Cultural Heritage Management Plan (ACHMP) should be developed to manage Aboriginal Cultural Heritage within the Williamtown SAP boundary. The ACHMP would provide guidance for the management of Aboriginal cultural heritage within the development catchments both during construction activities and into the future. The ACHMP would apply to the Williamtown SAP and will also outline the legislative context of the project in respect to heritage and the Aboriginal consultation which has been undertaken and would continue through the life of the project. For the practical management of Aboriginal cultural heritage, a clear outline of roles and responsibilities would also be provided along with operational flow charts to be used by Land Managers and contractors who may need to access, or conduct works, within the investigation area. The ACHMP would be produced in consultation with the Registered Aboriginal Parties (RAPs) that have expressed an interest in the project.

## 7.4 ONGOING ABORIGINAL CONSULTATION & INVOLVEMENT

Procedures are in place for the continued consultation and involvement with the Aboriginal stakeholders. This includes the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010).

All future ACHA assessments will be undertaken as per the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010).

## 7.5 CULTURAL AWARENESS INDUCTION

Part of the site induction for the entire SAP project and all future development within the SAP boundary should include an induction on the cultural heritage of the project area. All personnel on site must be inducted and as such are made aware of the cultural heritage across the project area. The induction package can be included in the ACHMP that will be developed in consultation with the RAPs following the ACHA survey.

# 8 RECOMMENDATIONS

*Important note: some of the recommendations are beyond the master planning phase and will form part of the early works or delivery phase.*

## 8.1 GENERAL

In light of the contextual information, AHIMS results, traditional knowledge and project requirements, the following recommendations are provided, noting that some of the recommendations are beyond the master planning phase and will form part of the early works or delivery phases:

1) An Aboriginal Cultural Heritage Assessment (ACHA) of the Williamtown SAP with a significance assessment and preliminary impact assessment should be undertaken as part of any future Development Application as follows:

    a) Field surveys of the whole SAP boundary in the first instance to ground truth known AHIMS sites and identify any new sites and PADs. This would produce an ACHA and be undertaken as per the Heritage NSW- Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b);

2) AHIMS sites 38-4-1146, 38-4-1157, 37-6-4173, 38-4-2005, 38-4-0301 and 38-4-0053, will require ground truthing, re-assessment and re-recording to enable the determination of appropriate mitigation measures for these sites.

3) Where areas of PAD are identified, An updated Aboriginal Cultural Heritage Assessment (ACHA) of the Williamtown SAP with a more detailed significance assessment and impact assessment should be undertaken as part of future Development Applications as follows:

    a) Test excavations in the development area, as identified through archaeological field surveys. This would be conducted in accordance with the Heritage NSW - Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b) and will be incorporated into the ACHA as an addendum.

    These ACHAs would include the desk top assessment (environmental, cultural and archaeological contexts), the results of further investigations, significance assessment, impact assessment, identify potential conservation, mitigation and management measures.

4) The requirement for an Aboriginal Cultural Heritage Management Plan (ACHMP) should be a condition of any future Development Approval. This plan will be developed to manage Aboriginal Cultural Heritage within the SAP boundary and developed in full consultation with the RAPs, DPE, archaeologist and Heritage NSW. It should include the following requirements:

e) The persons responsible for the management of onsite works will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974.

f) The involvement of the registered Aboriginal stakeholders in the ongoing management of the Aboriginal cultural materials within the project study will be promoted and included in the ACHMP.

g) A cultural awareness program will be included as part of the site induction program and developed with the registered Aboriginal stakeholders and form part of the ACHMP and the site induction for all workers on site.

h) Should a site or place be identified that required conservation/protection, this will be managed in an appropriate manner in full consultation with the RAPs, DPE, archaeologist and Heritage NSW.

5) Salvage excavations/community collection in the staged or early works approval areas would follow the survey and test excavations (if required) of the approvals process. These would be conducted in accordance with the ACHMP and with the Heritage NSW - Department of Premier & Cabinet, Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010), the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b). Salvaged Aboriginal heritage material should be relocated to the existing Keeping Place near the Newcastle Airport.

## 8.2 PERFORMANCE CRITERIA

Following the above recommendations for the Aboriginal heritage values of the Williamtown SAP, proposed performance criteria are presented below.

Table 8.1 Proposed performance criteria – Aboriginal heritage

| Performance Criteria No. | Performance Criteria Description |
|---|---|
| 1 | Incorporate an appreciation of Aboriginal heritage values into the Structure Plan |
| 2 | Protect Aboriginal heritage sites throughout project design and execution and avoid adverse impacts to Aboriginal heritage values wherever possible |
| 3 | Undertake ACHAs with survey, test excavation and salvage (if required) with a qualified archaeologist and representatives of the RAPs in accordance with the Heritage NSW requirements |
| 4 | Develop an ACHMP in full consultation with the RAPs, DPE, an archaeologist and Heritage NSW |
| 5 | Where adverse impacts to Aboriginal heritage values are unavoidable, undertake a salvage program with a qualified archaeologist and representatives of the RAPs in accordance with the ACHMP |
| 6 | Conduct ongoing consultation with the RAPs to keep the community informed about the progress of SAP development and obtain feedback on mitigation of impacts to Aboriginal heritage values and opportunities for meaningful engagement |

| Performance Criteria No. | Performance Criteria Description |
|---|---|
| 7 | Protect and mitigate incidental harm to unrecorded Aboriginal heritage values through the implementation of a sound chance finds procedure |
| 8 | Interpret Aboriginal heritage values in collaboration with community with the aim of enhancing significant values and creating a sense of place |

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# APPENDIX A Aboriginal Stakeholder Consultation

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# APPENDIX B AHIMS Search Results

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# APPENDIX C Summaries of Local Assessments

**Dyall, L.1975. Report on Aboriginal Sites near Newcastle. Report prepared for the University of Newcastle.**

Dyall (1975) undertook an archaeological study of Aboriginal sites located in the vicinity of Newcastle. The report was a literature review of past archaeological studies across the Newcastle area, resulting in the production of a list of previously identified sites within that area. Dyall's intentions were academic, with this report being produced for the University of Newcastle. No environmental data or predictive model were produced for this report. No specifics were included in this report on the author's methodology or if additional survey was employed. Eighteen sites were listed and are summarised below in Table 1 and no recommendations were made.

Table 1. Summary of sites (Dyall 1975)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Birubi Point | midden | not provided | not provided | not provided | shell, 1 Bondi point, animal bone | erosion | yes |
| Boat Harbour | midden | not provided | not provided | unnamed creek & marsh | shell, artefacts | bulldozing | yes |
| Fishermans Bay | midden | not provided | not provided | unnamed creek | shell, 1 chert flake | bulldozing | yes |
| One Mile Beach | midden | not provided | not provided | unnamed creek | shell, artefacts | erosion | yes |
| Boulder Bay | artefact scatter | not provided | not provided | not provided | artefacts | bulldozing | yes |
| Salamander Bay | midden | not provided | not provided | not provided | shell, artefacts | vegetation removal | yes |
| Williamtown | midden | not provided | not provided | not provided | shell, artefacts (including worked green glass) | not provided | not provided |
| Williamtown South | artefact scatter | not provided | not provided | not provided | 83+ artefacts | Erosion& air base runway construction | yes |
| Freshwater Lagoons | artefact scatter | sand slopes | not provided | not provided | artefacts, shell fragments | erosion | yes |
| Mac's Track | artefact scatter | not provided | not provided | not provided | chert artefacts | not provided | not provided |
| Mac's I | midden | dune | not provided | not provided | shell, artefacts | not provided | yes |
| Boyce's Beach | midden | dune | not provided | chain of lagoons | shell, animal bone& edge ground axes | Gunnery range for RAAF | yes |
| Dark Point | midden | headland | not provided | not provided | shell, bone | cyclone | yes |

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Horse Run | artefact scatter | ridge | not provided | not provided | artefacts | not provided | not provided |
| Dudley | isolated artefact | not provided | not provided | not provided | worked green glass artefact | not provided | not provided |
| Dudley 4 | midden | base of cliff | not provided | not provided | shell, 7 waste flakes | cyclone | yes |
| Galadea | midden | not provided | not provided | not provided | shell | not provided | yes |
| Boncon | isolated artefact | not provided | not provided | unnamed creek & waterfall | 1 | track | not provided |

**Sullivan, M. E. 1978. An Investigation of an Archaeological Site at Stockton Bight, NSW. Report prepared for Mineral Deposits Limited.**

Sullivan (1978) undertook an archaeological investigation of two previously identified sites located at Stockton Bight in NSW. The first site (Site A) had been recorded in 1974. The date of recording for the second site (Site B) was not noted. The area where Site A was located was proposed for sand mining activities, including dredging and deposit removal. It was stated that the proposed activities would destroy Site A. The investigation area was within a dune system at Stockton Bight. The dunes were high with some blowout areas. Water sources in the study area included freshwater lagoons and depressions of standing water. Vegetation in the area included such resource plants as *Banksia serrata* and native cherry. A search of the NPWS register had identified Site A and Site B within the study area. No further search result details were included in this report. No survey was undertaken for this study, which was limited to an inspection of the two previously identified sites. Site A was a midden with charcoal and stone artefacts as well as shell. It was estimated to cover approximately 2000 square metres. Site B was a midden deposit with pipi and oyster shell. At both sites the material was interpreted as being indicative of long-term habitation. Sullivan recommended that a systematic survey be carried out for the study area prior to works commencing. It was recommended that Site A be destroyed, but with salvage to be considered as a mitigation measure to be carried out prior to destruction. It was recommended that Site B be protected and conserved.

**Koettig, M. 1987. Preliminary Assessment of Aboriginal Archaeological sites in the proposed sand extraction location at Nelson Bay Road, Newcastle Bight: DP 530095. New South Wales. Report to W. R. Corkery and Co. Pty Ltd.**

Koettig (1987) undertook an assessment for a proposed sand quarrying located in the vicinity of Nelson Bay Road near Stockton. The proposed sand quarrying was to involve quarrying a section of sand crossing Outer Barrier dunes of Holocene age, in an area that would have been a resource rich zone in the past. The topography of the study area was very gently undulating with the height between dune crest and wale averaging less than 20 metres. The dune ridges ran from southwest to northeast, were higher in the southern portion of the study area and were sometimes associated with swamps. There was little evidence of past disturbances with the area mostly untouched, with the exception of a transmission line that cut across the western portion of the study area and three tracks that ran approximately east to west across the dunes. Vegetation consisted of a range of communities and species, including blackbutt, smooth-barked apple, banksia, swamp mahogany, melaleuca, swamp oak, broad leaved paperbark and the orchid Pterostylis. A search of the NPWS sites register identified 47 known sites, 45 of these being middens. No predictive model was compiled for this

report. The survey focused on exposures and investigation with a Luebers probe along a ridgeline and in association with identifiable shell middens, to test for subsurface indication of shell and depth. Eleven new sites were identified and are summarised in the table below.

Table 2. Summary of sites (Koettig 1987)

| Site | Site type | Landform | Distance to Water | Stream Order | Artefacts /Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| NBR1 | midden/ artefact scatter | dune top | not noted | Hunter River | shell midden, 40 artefacts | exposure, track | not noted |
| NBR2 | midden/ artefact scatter | dune top | not noted | Hunter River | shell midden, 3 artefacts | track | depth below surface 15 to 20 cm |
| NBR3 | midden | dune top | not noted | Hunter River | shell midden | track | depth below surface 10 to 15 cm |
| NBR4 | artefact scatter | dune top | not noted | Hunter River | 6 artefacts | track | not noted |
| NBR5 | artefact scatter | slope | not noted | Hunter River | 2 artefacts | track | not noted |
| NBR6 | midden | dune top | not noted | Hunter River | shell midden | track | depth below surface <10 cm |
| NBR7 | midden/ artefact scatter | dune top | not noted | Hunter River | shell midden, 3 artefacts | track | not noted |
| NBR8 | midden | dune top | not noted | Hunter River | shell midden | track | depth below surface to 25 cm |
| NBR9 | midden | dune top | not noted | Hunter River | shell midden | track | not noted |
| NBR10 | midden | dune top | not noted | Hunter River | shell midden | track/ exposure | not noted |
| Isolated Find | isolated find | not noted | not noted | Hunter River | 1 stone artefact | not noted | not noted |

Koettig concluded that the survey results demonstrated a continuous distribution of midden and stone artefacts across the dune crests in the northern portion of the study area. It was further pointed out that the absence of sites located in the southern portion did not mean there were no sites there, since the area was not deeply disturbed enough to reveal subsurface deposits. It was further noted that there was a possibility that burials may have taken place in the dunes, as previously two had been found in Newcastle Bight and one on Broughton Island associated with midden deposits. Due to the lack of exposure in some areas, lack of previous investigation and poor recording of past sites, it was determined to be impossible to establish the significance of the newly recorded sites. It was recommended that test excavations needed to be undertaken and resource extent determined in order to assess site representativeness, "and hence whether destruction of the sites is a valid alternative recommendation, or whether the site should be preserved".

**Smith, L.1988. Archaeological Survey of the Tomago to Karuah section of the Tomago to Taree 132kV transmission line. Report prepared for the Electricity Commission of NSW.**

Smith (1988) completed an archaeological survey of the Tomago to Karuah section of the Tomago to Taree 132kV transmission line. The transmission line easement was approximately 22 kilometres in length and 45 metres in width. The proposed works associated with the transmission line included clearing the easement, the construction of vehicle tracks and the erection of poles. Landforms across the study area consisted predominantly of undulating plains. The underlying geology was Quaternary deposits of sand, gravel, silt and clay. Outcrops of the Tomago Coal Measures, with shale, mudstone, sandstone, tuff and coal, occurred in the study area to the north of Medowie. Permian deposits of sandstone, siltstone and conglomerate occurred from the north of Medowie to just west of Reedy Creek. Around Reedy Creek and Karuah undifferentiated Carboniferous deposits were present. Several minor creeks and gully lines were crossed by the study area and three major creek lines that the study area crossed were Pipeclay Creek, Twelve Mile Creek and Reedy Creek. A fresh water spring also occurred on the south bank of Twelve Mile Creek. Between Tomago and Medowie the vegetation largely consisted of open woodland, while from Medowie to Pipeclay Creek the vegetation consisted of Tea Tree Scrub. Plant species noted as present within the bounds of the study area included bloodwood, grey gum, bracken fern, swamp mahogany, tea tree, rough barked apple and various grasses. A search of the NPWS register identified middens, artefact scatters, modified trees, burials, stone arrangements and quarries in the surrounding area. Based on known sites in the surrounding region it was predicted that midden sites could occur along Reedy Creek and Twelve Mile Creek. It was further predicted that artefact scatters could occur in dry flat landforms, burials could occur in sandy deposits and modified trees and stone arrangements could occur in areas that had not been cleared or developed. Two artefact scatters and one isolated artefact were located during the survey and summarised in the table below. It was suggested that the lack of other site types identified during the survey may have been due to a generally low ground surface visibility within the study area. Smith recommended that sites TK1 and TK2 were to be avoided and protected.

Table 3. Summary of sites (Smith 1988)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| TK1 | artefact scatter | modified | not provided | not provided | 50+ | vehicle track & transmission line | no |
| TK2 | artefact scatter | sandy knoll | 0m | Telegraph Swamp | 1000+ | erosion, bulldozing & mining | yes |
| Isolated Find | isolated artefact | slope | not provided | not provided | 1 silcrete flaked piece | transmission line easement | yes |

**Brayshaw, H. 1989. Archaeological Survey of Area of Proposed Silica Sand Extraction, Tanilba Northern Dune, Port Stephens, NSW. Report to ACI Operations Pty Ltd, Industrial Minerals Division.**

Brayshaw (1989) undertook an archaeological survey of a section of the Tanilba Bay northern dune in Port Stephens that was due to be impacted by proposed silica sand extraction activities. The topography of the area that was to be impacted by the proposed works consisted on an elevated section of dune measuring 4.5 kilometres by 0.6 kilometres. The white sand surface of the dune was highly mobile with an elevation of over 20 metres. The dune extended southwest and was surrounded by swamp flats. Deposits in the area consisted of Quaternary silt, sand and clay. Past impacts in the area included sand removal, vehicle tracks, bulldozing, transmission lines and electricity substations at the south-western end of the study area. Surrounding water sources outside the study area included Tilligerry Creek and the Hunter River. Vegetation on the dunes included scribbly gum, bloodwood, Banksia, grass trees and flannel flowers. The swampy flats included geebung, acacia, bracken, pigface, banksias and grevilleas. Although Brayshaw noted that a search of the NPWS sites register was undertaken prior to the survey, the details of the results of this search were not included in the report. However, as a result of a review of previous investigations conducted in the vicinity of the study area, the following site types were predicted as likely to be encountered in the study area:

- Shell middens – accumulations of shellfish remains perhaps containing other cultural material but probably small in size. Thin surface scatters of artefacts could result from mobile hunting activities. Single occurrences might relate to tool loss or abandonment, or tool maintenance.
- Burials – which are generally only visible where subsurface sediments and their contents have been exposed by disturbance or erosion. They can occur collectively in shell midden deposits or individually almost anywhere. Generally, they are found in soft sediments such as sand or sandy loam, such as that occurring in the study area.
- Scarred trees – the result of the removal of bark or wood for the manufacture of canoes, containers or shelter.

The survey focussed on areas elevated above the swamp flats as well as samples of exposed areas on the flats. All mature trees were inspected for signs of scarring. Four sites were identified and are summarised in Table 4.

Table 4. Summary of sites (Brayshaw 1989)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| #1 Oyster Cove | midden/ isolated find | dune slope | 7m | swampy flat | 1 artefact, cockle, oyster, mud whelk, mud oyster | moderate (nearby service road and sealed road) | not noted |
| #2 Tanilba Bay | artefact scatter with dispersed shells | dune slope | 3m | swampy flat | 8 artefacts, mud whelk, cockle, oyster | high (bulldozed sections of dune) | not noted |
| #3 Tanilba Bay | artefact scatter | dune slope | 15m | swampy flat | 34 artefacts | high (section of dune has been cut away) | not noted |
| #4 Tanilba Bay | artefact scatter | dune slope | 2m | swampy flat | 10 artefacts | high (excavated pit and nearby road) | not noted |

It was noted that due to dense vegetation cover some archaeological sites may have been missed at the time of the survey. It was further noted that site #1 was outside the study area and would not be impacted by proposed works. Due to the high levels of disturbance noted at sites #3 and #4 it was recommended that consent to destroy permits be sought and artefacts be collected should the proposed works impinge on these locations and that Site #2 should be preserved without any further disturbance. In order to achieve this, an area 100 metres wide, extending at least 40 metres south of the swamp should be fenced off.

**Dean-Jones, P. 1990. Newcastle Bight Aboriginal Sites Study. Report to NPWS.**

Dean-Jones' extensive archaeological survey of Newcastle Bight in 1990 has contributed significantly to our understanding of the archaeology of the region. She recorded 119 Aboriginal sites during the survey with an additional 40-50 middens noted, but not recorded due to time constraints. The distribution of known sites prior to this study appeared to be clustered around the north eastern shoreline of Birubi Point, the mouth of Tilligerry Creek, near Salt Ash and the Hunter River estuary/Fern Bay area. This trend was thought to be a factor of archaeological studies being undertaken for specific development applications rather than a definitive picture of archaeological site distribution across the Newcastle Bight. Sites were commonly found in several geomorphic environments, including bedrock marine headlands, open estuarine shoreline, Pleistocene and Holocene dunes. Dean-Jones also found sites in these environments, however, distribution varied. The majority of sites recorded by Dean-Jones were shell scatters (34.5%) followed by open artefact scatters (17.4%). Almost 74% of all sites comprised either estuarine or marine shell, although only 12% were classified as stratified deposits. Most sites were located in the seaward margins of active transgressive sand dunes/active blowouts (34 sites) or beach/fore dune or outer deflation basins (28 sites).The survey's findings showed site distribution in some areas was much greater than previously thought with notable differences in the beach/deflation basin and transgressive dune system. Collectively, approximately 20% of all recorded sites were directly associated with Interbarrier depression wetlands. Most of these sites were on either Pleistocene transgressive dunes or Holocene transgressive dunes. Sites on the Holocene side of the Interbarrier depression contained large numbers of marine and freshwater shell species. Dean-Jones (1992) also surveyed and conducted shovel testing across a large area at Fern Bay. The ground surface visibility was relatively good due to a recent bushfire that had removed much of the vegetation. The shovel test excavation was

undertaken to determine the local geomorphology and its implications for the age and location of archaeological sites. Dean-Jones concluded that archaeological sites within the study area have a maximum age of 4500 BP. This is because aeolian re-working of the barrier surface (during the period of accretion) would have effectively destroyed all archaeological sites before 4500 BP.
Dean-Jones (1990) indicates that archaeological material is generally limited to the upper 50 centimetres of the dune soil profile. She also noted that there were several problems associated with the definitions of shell deposits during survey, noting that both anthropogenic and natural shell deposits were observed. She suggests that the maximum age for occupation evidence on the outer stable transgressive dune is 1200 BP, which represents the period of time that this dune has been stable. Prior to 1200 BP this dune was actively mobile which means that archaeological material would have been re-worked and deflated or dispersed. The results indicate that archaeological evidence is concentrated on elevated ground, but not necessarily on the main or higher ridge, most sites were found within the inner (4000 BP) stable dune field. Archaeological evidence within the 1200 BP dune field is rare except along its seaward margin. Dean-Jones also notes that there appears to be a relationship between site distribution and the presence of freshwater within the dune field, with evidence of occupation most common where elevated ground is separated by the swamp forest wetlands. Sites in the study area include shell only, flaked stone only or both shell and flaked stone, however, it is not clear if the variations are due to surface visibility or to real differences in site types across the dunes. The distribution of shell species across the dune field suggests that shellfish were not transported across the barrier system. Sites with pipi (a marine species) are confined to the outer margin of the barrier and sites with *Pyrazus* and oyster (estuarine species) are distributed across the inner barrier. Shovel testing undertaken by Dean-Jones found that flaked stone occurred most commonly at a depth of 30 – 60 cm below the surface, and as deep as 90 cm at one site.

**Brayshaw McDonald Pty Ltd. 1990a. Archaeological Survey of proposed Raymond Terrace By-pass, Pacific Highway, New South Wales. Report to Road & Traffic Authority, Sydney.**

Brayshaw McDonald Pty Ltd (1990a) completed an archaeological assessment of a proposed bypass for the Pacific Highway located at Raymond Terrace. The proposed works included vegetation clearance, earthworks and associated road construction activity. The study area was located in the lower Hunter Valley on the northern bank of the Hunter River, just below its junction with the Williams River. The study area (defined by the proposed bypass alignment) was situated on Quaternary sands, with the land surface at the time of inspection estimated as being approximately 7000 years old. Water sources within the study area included the Hunter River, its junction with the Williams River, the catchment of Grahamstown Lake, Windeyer Creek and two swampy areas. Vegetation had been cleared within the study area, with grasses and regrowth predominating. Other vegetation species identified included paperbark, bracken fern, spotty gum and scrub. No AHIMS search results were included in this report, but a review of past reports was utilised to inform a predictive model, identifying possible sites to occur in the study area to be middens, open camp sites, burials and scarred/carved trees. This model identified surface or thinly stratified occupation deposits as likely to occur in the coastal dunes, thin to substantial midden deposits likely to occur along the rocky coast and rock platforms, and substantial occupation sites likely to occur at the interface of open coast and estuarine zones. The survey results supported the predictive model. Ground surface visibility was noted as being poor within the study area and five sites were identified and are summarised in Table 5. It was recommended that further archaeological investigation works be undertaken at RT1 and RT3 to assess their extent and scientific significance. No further works were recommended for RT2, RT4 and IF1, with Consent to Destroy permits recommended for these.

Table 5. Summary of sites (McDonald 1990)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| RT1 | artefact scatter | flat | not noted | Grahamstown Drain | stone artefacts, shell, bone 2 hearths | sand quarrying | yes |
| RT2 | artefact scatter | not noted | not noted | Grahamstown Drain | 7 mudstone artefacts | sand quarrying, vegetation clearance | no |
| RT3 | artefact scatter | creek bank | 5m | Windeyers Creek | 12 mudstone artefacts | relatively undisturbed | yes |
| RT4 | scarred tree | not noted | not noted | not noted | scarred tree | axe marks | no |
| IF1 | isolated find | not noted | not noted | not noted | 1 mudstone flake | exposed track | no |

**Brayshaw McDonald Pty Ltd. 1990b. Additional Archaeological Survey of proposed variation along Raymond Terrace By-pass, Pacific Highway, New South Wales. Report to Road & Traffic Authority, Sydney.**

Following the initial survey of the proposed bypass (Brayshaw McDonald 1990a) Brayshaw McDonald (1990b) was commissioned to undertake a further archaeological survey of a variation route. The study area was located in the lower Hunter Valley in a boggy area associated with Windeyers Creek. The variation route that comprised the study area ran for a length of 3km with a corridor width of approximately 350m. Past disturbances in the area included the open sillage of masonite by-products, ploughing and the dumping of sewerage by a port-a-loo company. The study area was situated on largely flat, boggy ground with low ground surface visibility and high levels of surface water at the time of inspection. The closest water source, Windeyers Creek, was in close proximity. Vegetation had been cleared within the study area, with grasses and regrowth predominating. Other vegetation species identified included paperbark. No AHIMS search results or predictive model were included in this report, which acted as an appendix to a previous survey report. One new artefact scatter consisting of 7 mudstone artefacts located along a creek bank was identified as highly disturbed through clearing and ploughing with no potential for sub surface sites. Brayshaw recommended that further investigations occur at site RT3 to assess extent and scientific significance. No further investigations were recommended for site RT5. A Consent to Destroy permit was recommended to be sought for site RT5.

**Dean-Jones, P. 1991. Preliminary Assessment of Archaeological Material and Taphonomic Geomorphology at RZ Mines Pty Limited, Plant No.1, Galloping Lead South Results of Stage 1 Investigation. Report prepared for RZ Mines Pty Limited.**

Dean-Jones (1991) undertook an archaeological and geomorphological assessment of an artefact scatter site identified at Plant No. 1 at Galloping Lead South Mine. The mining operation was for sand extraction over large areas of the Pleistocene Sand Barrier at Newcastle Bight. Mineral sands were extracted from Pleistocene beach ridges and low dunes by a floating suction dredge. Preliminary processing, involving the removal of oversized material and separation of heavy mineral sands from quartz sand, took place adjacent to the extraction area. The topography of the

investigation area consisted of a low dune adjacent to Galloping Swamp. Water sources were present in intra barrier wetlands and other freshwater wetlands located nearby, including Moffats Swamp, Campvale Swamp and Telegraph Swamp. The artefact scatter site assessed in this study had been located within dunes formed by aeolian reworking of the old beach ridge plain. Vegetation removal had occurred previously within the study area in connection with past sand extraction activity. The report identified that a large number of Aboriginal sites had been recorded within the Newcastle Bight sand mass and on pre-Quaternary rock units around the margins of the sandy barrier system. On the Pleistocene barrier, flaked stone material was associated with late Pleistocene transgressive dunes, particularly where those dunes were adjacent to Holocene estuarine wetlands, or to Pleistocene freshwater wetlands. It was noted that all previously identified sites occurred in areas of disturbance, as ground surface visibility on undisturbed dunes was zero. Dean-Jones argued that the stratigraphic context of the stone material was not clear. No stone was visible anywhere on the surface of the dune, either on the relatively undisturbed crest to the south of the dredge face, on surfaces where topsoil had been stripped in preparation for mining or on surfaces disturbed by previous plant relocation activities. A shallow test pit (1m x 1m x 1m) was dug on the crest of the low dune to the south of the plant to examine the near surface stratigraphy and soil profile morphology of the dune. Subsequently three further test pits each approximately measuring the same size were excavated in the undisturbed flank of the dune northeast of Plant 1, which was designated as the next mining area. Loose dark grey sand was found overlying strongly bleached sand. No flaked stone was encountered in any test pits. Assessment of the archaeological material collected from the site did not identify any shell within the deposit. Flakes, flaked pieces, cores and pebbles/cobbles were present in the assemblage. Pale grey/white tuff (Nobbys tuff) appeared to be the most commonly utilized raw material, accounting for about 70% of the total. Shortland tuff, quartzite, buff/pink grey mudstone/tuffs, pink and grey igneous materials were also represented in significant quantities. It was recommended that procedures be put in place to assess areas for potential sites prior to works proceeding in future. This included detailed ground surface inspection by an archaeologist when vegetation was cleared, prior to mining as well as a re-inspection after the topsoil had been stripped and the $A_2$ soil horizon of the dune exposed over a large area. It was stated however that even with all preliminary investigations completed, there could be no guarantee that previously unknown archaeological material would not be encountered along the mining path. It was recommended that the possibility of consent to destroy permits not being granted, and management implications for mine planning should be discussed in advance. It was recommended that possible compensatory measures for the destruction of Aboriginal sites in the mining path should also be discussed in advance. It was suggested that these could include the protection of sites not affected by mining, research funding or funding of public education and interpretive material.

**Comber, J. 1991. Archaeological Survey of ACI Plant Salt Ash. Report prepared for Outline Planning Consultants Pty Limited.**

Comber (1991) completed an assessment of the ACI Industrial Minerals Plant at Lot 4, DP 774726, Oakvale Road Salt Ash. The study area had previously been used as a sand pit as well as for sand mining activity. ACI Industrial Minerals proposed to continue and expand sand mining activities at this location, and commissioned the archaeological survey to determine if there were any heritage constraints associated with the proposed works. The topography of the area included an inner barrier of Pleistocene dune, an interbarrier depression of late Holocene estuarine sediments and an outer barrier overlaid with large transgressive Holocene dune sheets. The study area was located on the margin of the outer Holocene transgressive dunes overlooking the interbarrier estuarine system. The underlying geology consisted of Quaternary deposits of gravel, sand, silt and clay. Raw materials in the region suitable for artefact manufacture included siliceous tuff, mudstone and basalt. The study area was sandy with only sparse vegetation. Those plant species that were identified included old man banksia, coast tea tree, broad-leaved geebung, Prickly paperbark, common

bracken and cycad. Located in a coastal area, the nearest freshwater source to the study area was Tilligery Creek located to the north. In the Aboriginal past it is likely there would have been water resources present from an extensive low-lying swamp area that had since been drained. A search of the NPWS register identified five middens were located immediately to the west of the study area. It was stated that the most common site types in the Newcastle Bight area were shell middens, with artefact scatters, burials and scarred trees also occurring but less frequently. It was predicted that sites were most likely to be identified on the tops of sand hills, with possible site types including middens (with or without stone artefacts), open sites containing stone artefacts, shell and faunal remains, open sites containing hearths, open sites containing large numbers of artefacts and burials. The predicted midden content and location of sites tallied with the survey results. Three middens were identified during the survey and are summarised below in Table 6.

Table 6. Summary of sites (Comber 1991)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Salt Ash Site 1 | midden | sand hill crest | not provided | Tilligery Creek | shell | erosion | yes |
| Salt Ash Site 2 | midden | modified | not provided | Tilligery Creek | shell & 5 artefacts | heavily disturbed by development | no |
| Salt Ash Site 3 | midden | modified | not provided | Tilligery Creek | shell & 6 artefacts | not in situ, site redeposited during overburden deposition | no |

**Resource Planning Pty Ltd. 1991a. Environmental Impact Statement, Titanium Minerals Mining, Big Swan Bay, Archaeological Survey. Report to RZM Pty Ltd.**

Resource Planning Pty Ltd (1991) undertook an archaeological investigation of lease application areas proposed for mineral sand mining. The mining lease application areas included numbers 134 to 138 inclusive (henceforth referred to as the study area). The study area was located to the west of Tanilba Bay in Port Stephens in an area extending parallel to the southern shoreline of Port Stephens and covering approximately 700 hectares. Disturbance in the study area included previous sand mining, covering 90% of the proposed mine path. Approximately 25% of the total study area (approximately 180 hectares) was proposed to be disturbed by the mine path. The topography of the study area included a section of the northern margin of the dual coastal barrier system at Newcastle Bight. The barrier system comprised an inner (Pleistocene) beach ridge sequence and an outer (Holocene) beach ridge sequence with bedrock headlands, low sandy cuspate headlands, salt marsh and mangrove wetland. Water sources in the vicinity included Tilligerry Creek and the estuarine wetlands. Vegetation in the area consisted of open dry sclerophyll woodland with *Angophora costata*, *Eucalyptus gummifera*, *Eucalyptus pilularis*, shrubs and acacia on the dunes. The salt marsh and marginal areas were characterised by swamp mahogany and Casuarina glauca woodland with grey mangrove (*Avicennia marina*) along the shoreline. A search of the NPWS sites register and review of reports of previously surveyed areas revealed a number of previously recorded sites. Each of these was located and re-recorded during the survey, consisting predominantly of artefact scatters with conspicuous deposits of estuarine shell. Based on review of the previous survey results it was predicted that areas of high archaeological sensitivity would be:

- The estuarine shoreline, particularly sandy cuspate headlands. Due to minor changes in the water table following past mining, other portions of the estuarine foreshore that were

waterlogged at the time of inspection were also considered to have moderately high archaeological sensitivity.

- All north facing slopes of the Pleistocene transgressive dunes which formed the southern boundary of the lease areas.
- Small areas of intact transgressive dune at the eastern and western ends of the study area.

A survey was conducted across the study area and a total of ten sites were identified (including previously recorded sites that were located and rerecorded). Six of these sites were located within the area to be disturbed by the proposed works, while a further four were marginal to the area of disturbance. All ten sites are summarised in Table 7. Sites were located in a variety of landforms conforming to those identified in the predictive model as archaeologically sensitive (headlands and dunes). Some sites were also located along the shoreline.

Table 7. Summary of sites (Resource Planning Pty Ltd 1991)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Site 1 (38-4-0182) | isolated find/shell scatter | not noted | not noted | not noted | 1 flaked piece & shell scatter | heavily disturbed | no |
| Site 2 (38-4-0181) | artefact scatter/shell scatter | dune slope | not noted | not noted | 8 stone artefacts & shell fragments | moderate (vehicle track) | yes |
| Site 3 (38-4-0183) | artefact scatter | dune embankment | not noted | not noted | 34 artefacts | moderate (surface of dune is mobile) | not noted |
| Site 4 (38-4-0184) | artefact scatter | not noted | not noted | not noted | 13 weathered grey mudstone/ tuff flakes & flaked pieces | moderate (nearby mine road and sand quarry) | not noted |
| Site 5 (38-4-0316) | artefact scatter/midden | shoreline | not noted | not noted | 2 cobble cores, 1 flaked piece & shell midden | high (eroding shoreline) | not noted |
| Site 6 (38-4-0317) | artefact scatter/midden | headland | not noted | not noted | 30+ artefacts & shell midden | high (eroding shoreline) | not noted |
| Site 7 (38-4-0318) | midden | sandy flat | not noted | not noted | shell midden | high (clearance/garden area) | not noted |
| Site 8 (38-4-0290) | artefact scatter/shell scatter | dune slope | not noted | not noted | 5 stone artefacts and a thin scatter of estuarine shells | heavily disturbed (power easement) | no |

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Site 9 (38-4-0291) | artefact scatter/shell scatter | dune lower slope | not noted | not noted | 4 flaked stone pieces (3 tuff & 1 silcrete) | heavily disturbed (access road & rubbish dumping) | no |
| Site 10 (38-4-0319) | artefact scatter | salt marsh | not noted | not noted | 80+ artefacts | moderate (erosion) | not noted |

Sites 1 and 2 were noted as within the area to be directly impacted by the proposed works. Site 1 was deemed to have low archaeological value and it was recommended a consent to destroy permit be sought. Site 2 was assessed as having potential for in situ subsurface deposits and it was recommended that limited additional investigations be undertaken with a preliminary research permit application and the involvement of WLALC. Sites 3, 4, 8 and 9 were determined as being adjacent to the area of mining activity, within 50 metres of the disturbance area. It was recommended that monitoring take place during construction works in proximity to these sites. Sites 5, 6, 7 and 10 were located outside the proposed mining area. It was recommended that these sites of high archaeological significance be preserved and given annual monitoring. It was further recommended that should any previously unrecorded sites be located during the proposed works that they should immediately be reported to the Hunter District Archaeologist of NPWS and an inspection and assessment be made.

**Resource Planning Pty Ltd. 1991b. Raymond Terrace Traffic Relief Route Additional Archaeological Investigations – Sites RT1 and RT3. Report to Roads & Traffic Authority NSW.**

Following two previous surveys that had identified sites RT1 and RT3, Resource Planning Pty Ltd (1991) was commissioned to undertake archaeological subsurface investigations of these sites. The investigations were commissioned due to proposed impacts to these sites resulting from the RTA construction of a two-lane traffic relief route from Masonite Road in the south to Belleview Street in the north at Raymond Terrace, NSW. The study area comprised unconsolidated Quaternary sediments and swampy areas located in proximity to Windeyers Creek, a tributary of the Hunter River. The discharge pattern of Windeyers Creek was noted as having been altered by the construction of the Grahamstown Drain. The study area was located on flat, swampy floodplain which had undergone past vegetation clearance. No AHIMS search results or predictive model were included in this report, which focussed solely on the subsurface investigation excavations undertaken in the areas of previously identified sites RT1 and RT3. As per the recommendations of Brayshaw McDonald Pty Ltd (1990) subsurface testing was undertaken in the locations of RT1 and RT3. The testing included a grid pattern of shovel test pits, with a total of 19 test pits excavated. The results identified that in-situ deposits at RT1 were unlikely, but that RT3 had the potential to contain very large amounts of flaked stone. A backed blade and geometric microlith were identified in the RT3 assemblage, as was a large amount of fine flaking debitage. Artefacts were found to occur between 20cm and 60cm depths. Artefact density ranged from 20 to 312 artefacts per metre cubed. A total of 1943 artefacts were located during test excavation across the area (predominantly mudstone flakes). The two previously identified hearths associated with RT1 were reassessed during testing and were identified as not being hearths, but rather pieces of road aggregate which had collapsed over the embankment. No recommendations were included in this report. It was concluded that if the proposed road corridor were confined to an area of old sand quarry that there would be no archaeological impacts, but should the road works extend beyond the old sand quarry along its eastern boundary then the remains of archaeological site RT3 would be destroyed.

**Resource Planning Pty Ltd. 1992. Fern Bay Sand Resource Potential Constraints and Strategy for Development Archaeological Survey. Report prepared for Boral Resources (NSW) Pty Ltd.**

Resource Planning (1992) completed a development strategy and constraints model for the proposed Fern Bay Sand Resource area. This study area was situated at Fern Bay on the southern portion of Newcastle Bight. The Bight stretched from the northern edge of the Hunter River in the south to the southern shore of Port Stephens in the north. The area was proposed for sand mining activity. The topography of the study area consisted of fore-dunes and a deflation basin with active transgressive dunes, in close proximity to the beach, formed from mobile sand. There was also an area of low, stabilised sand and swamp and an area of higher, stabilized transgressive dunes. Vegetation communities included dry sclerophyll low open forest dominated by smooth barked apple and blackbutt on the back dunes, a swamp sclerophyll forest of broad-leaved paperbark and swamp mahoganies with shrubs in the low lying swampy areas of the south east and north west areas of the property, and tea tree shrub along the active transgressive dune area. Blady grass and bracken fern were also present. The nearest permanent water source was the Hunter River, situated to the south of the study area. Swamp areas were utilised as water sources as well as waterholes. No NPWS search results were included in this report, but reference to past surveys in the area noted that middens (both with and without associated stone artefacts) were the most commonly identified site type in the general area. No predictive model was included in this report. The survey methodology was simple and involved covering a portion of each landform unit by walking. A range of topographic features such as ridge tops, slopes, spurs and gullies were examined. In addition, areas with little obvious disturbance and areas of greater ground surface visibility, such as vehicle tracks, were inspected. Sites were not recorded individually or in detail for this report. The available survey results are summarised below in Table 8.

Table 8. Summary of Fern Bay sites (Resource Planning 1992)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| unnamed | midden | foredune, deflation basin and active transgressive dunes | not provided | swamp | pipi shell | four wheel driving across deposit | yes |
| unnamed | midden | foredune, deflation basin and active transgressive dunes | not provided | swamp | pipi shell | four wheel driving across deposit | yes |
| unnamed | midden | low lying area of stabilised sand | not provided | waterholes | pipi shell | wind & animals | yes |
| unnamed | midden | low lying area of stabilised sand | not provided | waterholes | pipi shell | wind & animals | yes |
| unnamed | artefact scatter | stabilised transgressive dunes | not provided | not provided | 8 | road | not provided |

By using the information from previous archaeological surveys and the results from the survey, areas of archaeological sensitivity were identified. These areas of Potential Archaeological Deposit (PAD) are summarised below in Table 9.

Table 9. Summary of Fern Bay PADs (Resource Planning 1992)

| PAD | Landform | PAD area | Disturbance | Subsurface potential |
|---|---|---|---|---|
| PAD 1 | deflation basin | not provided | not provided | yes |
| PAD 2 | low lying area between dunes | not provided | not provided | yes |
| PAD 3 | stabilised transgressive dunes | not provided | not provided | yes |

It was stated that salvage work may be required prior to sand extraction activity being able to progress. It was recommended that permits be sought from NPWS and should salvage works occur that they be carried out with full consultation, approval and cooperation with the Worimi Local Aboriginal Land Council (WLALC).

**Baker, N. 1993. Archaeological Testing of the RZM Pty Ltd Plant 9 planned sand mine run adjacent to Moffats Swamp, Richardson Rd, Medowie. M.L.1067. Report prepared for RZM Pty Ltd.**

Baker (1993) completed archaeological subsurface testing under NPWS permit #476 across a series of large vegetated sand dune crests directly across Richardson Road from Moffats Swamp, Medowie between Newcastle and Port Stephens, NSW. This investigation area was proposed to be utilised for the mining of heavy titanium minerals. Landforms across the investigation area consisted predominantly of swampland with associated dunes. The investigation area contained a dual barrier dune system. During the late Pleistocene (around 140,000 years ago) the deposition of beach sand blocked off several valleys to form a series of fresh water swamps. This inner barrier dune system was reworked during the last glacial period towards the very end of the Pleistocene. The outer barrier dune system overlaid part of the older beach ridge plain in the Holocene. Vegetation consisted of Angophora Bloodwood Blackbutt mixed community open forest. Moffats Swamp was the main water source in the area, one of a series of swamps which occurred at the inner margin of the Newcastle Bight sandy country. It was noted that artefacts and shell material had been uncovered during sand extraction activity in the surrounding region and other sites in the general area consisted predominantly of artefact scatters and middens. It was predicted that sites were most likely to occur on dune crests in association with water. This prediction was proved accurate by the results of the archaeological testing. The field strategy undertaken during the testing at this location was based on a systematic augering strategy. Visual inspection noted that no cultural material was apparent on the surface although flakes had occasionally been detected in road cutting exposures. Fieldwork methods included auger transects, road cutting sampling, controlled test excavation and shovel pit transects. Eighty auger holes were dug over seven transects and several minor test lines. Holes were dug every 10 metres and were labelled according to the distance from the starting point of the transect. Two sites were identified during subsurface testing across the area. The test excavation results are summarised below in Table 10.

Table 10. Summary of sites (Baker 1993)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Moffats Swamp 2 | artefact scatter | dune crest | 100m | Moffats Swamp | subsurface stone artefacts | road cutting | yes |
| Moffats Swamp 3 | artefact scatter | dune crest | 500m | Moffats Swamp | subsurface stone artefacts | road cutting | yes |

Baker stated that although Site MS2 will not be affected by any excavation caused by dredge mining, care should be taken not to disturb the site however when stockpiled sand close to this area is spread by bulldozer back over the mine run during rehabilitation. Also, that Site MS3 requires a Consent to Destroy permit for the portion of site MS3 that falls within the mine path, conditional on the controlled recovery of all cultural material from the Plant 9 oversize reject sieves by a qualified archaeologist and a representative of the Worimi LALC when the site is mined through. The artefacts recovered should be analysed and the limit of disturbance should be clearly marked on a survey plan.

**Davies, S. J. 1993. An Archaeological Assessment of ten Telecom Optic Fibre Cable Routes located between Gosford and Wauchope, Central Coast, NSW. Report to Telecom Australia.**

Davies (1993) completed an assessment for ten proposed routes for Inter Exchange Network Optic Fibre Cables located between Gosford and Wauchope. It was proposed by Telecom Australia to install these cables via plough and ditch methods. Routes 1 and 2 were in the Gosford area, Routes 3 to 6 were in the Williamtown area, Routes 7 and 8 were in the Forster area, Route 9 in Gloucester and Route 10 in Wauchope. The proposed routes followed, wherever possible, existing utilities, easements and roads. Route 1 was from Woy Woy (Ettalong Beach) to Wagstaff Point, following the course of an existing conduit adjacent to a dirt track. From there it was proposed that divers would jet the cable to the floor of the channel of Brisbane Water. The main topography crossed by this cable was beach and channel. The beach areas comprised Quaternary deposits of quartz sand with minor shell deposits at Ettalong Beach and lithic-quartz sandstone, shale, quartz and laminate at Wagstaff. Route 2 was from Erina to Mt Elliott and followed existing roads and service corridors. In one section it crossed an overgrown/disused road area and crossed at Erina Creek where a bridge had once been located. Vegetation in the area had been altered from its original composition and contained mainly dry sclerophyll forest with a grassy understorey. A ridge crest area was included as part of this route. Route 3 was from Mayfield to Stockton; Route 4 from Stockton to Williamtown; Route 5 from Williamtown to Medowie and Route 6 from Medowie to the Pacific Highway. These four routes were all within the Williamtown area, consisting of a large coastal embayment filled by Pleistocene and Holocene sandy deposits. Inner barrier transgressive dunes comprised the majority of the topography. The majority of the area had been cleared of vegetation apart from grasses, with the exception of the Medowie to Pacific Highway route which had a dry sclerophyll forest with a grassy understorey. Route 7 was from Forster to Pacific Palms and Route 8 from Pacific Palms to Smiths Lake. Both of these routes were in the Forster area with a topography of dunes crossing Quaternary deposits of sand. Route 9 was from Stratford to Waukivory in the Gloucester area, covering cleared land with vegetation consisting of open pastures of grasses with only the occasional tree. Route 10 was from Yarras to Ellenborough in the Wauchope area, mostly following the alignment of the old Oxley Highway in an area that was already heavily disturbed. A review of past reports and searches of the NPWS sites register were compiled to inform the basis of a predictive model. This model predicted nine main site types that might have been encountered along the ten routes. These site types were: stone artefact scatters (open sites), shell middens, axe grinding grooves, quarries, scarred trees, Earthen circles, stone arrangements, rock engravings, burials, mythological sites and contact period sites. Multiple searches of the NPWS sites register were undertaken prior to the survey. No

sites were located within the proposed corridors for Routes 1 or 2. No sites were located within the proposed Routes 3 to 6, but 14 sites were registered adjacent to some of these proposed routes. No sites were within Routes 7 and 8, although numerous sites were in the region surrounding them. No sites were located within Route 9 or Route 10, although Route 10 had once had a carved tree in its vicinity, but this appeared to have since been destroyed. No sites or PADs were identified along Routes 1, 2 and 3. Although no sites were within the bounds of Route 4, three middens were recorded in close proximity to the route. No sites or PADs were identified on Routes 5, 6, 7, 8, and 10. The predictive model was accurate in determining the site types within the areas of these routes, but what became apparent on the survey was the level of past disturbance that had impacted on these areas, meaning that sites like scarred and carved trees had been destroyed by vegetation clearance. The sites that were identified on the survey are summarised in Table 11.

Table 11. Summary of site (Davies 1993)

| Site | Site type | Landform | Distance to water | Stream 0rder | Artefacts/ Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Midden 1 | midden | foreshore | not noted | Hunter River (6th) | shell | high (dissected by road) | yes |
| Midden 2 | midden | foreshore | not noted | Hunter River (6th) | shell | high (house, outbuilding construction) | no |
| Midden 3 | midden | foreshore | not noted | Hunter River (6th) | Shell including cockle, oyster and whelk | high (dissected by Fullerton Cove Rd) | yes |

Since no archaeological material was identified on any of the routes (with the three shell middens encountered during the Route 4 survey being outside the impact area) it was recommended that the proposed works go ahead. It was recommended that no deviation from the surveyed areas take place during construction works and that if any archaeological material be discovered during works that they immediately cease and the appropriate authorities be notified.

**Evans, S. 1993. Human Skeletal Remains Salt Ash, Stockton Beach. Report prepared for the Aboriginal Heritage Information Unit.**

Evans (1993) undertook an archaeological investigation of human skeletal remains identified on Stockton Beach in the suburb of Salt Ash. Evans undertook the investigation in her capacity as Project Officer at the Department of Environment, Climate Change and Water (DECCW), since renamed as the Office of Environment and Heritage (OEH). The suburb of Salt Ash is located in the Port Stephens local government area and situated between Newcastle and Nelson Bay. The site was utilised in the past forth Salt Ash Air Weapons Range. The southern section of Salt Ash contains Stockton Beach, a 32-kilometre stretch of beach between Stockton and Anna Bay. The beach has been utilised for 4WD activity, sand mining and fishing. The topography consisted of sand dunes. Limited vegetation was present on the sandy foreshores, stabilising those dunes. Vegetation species included *Chrysanthemoides monilifera subsp. rotundata*, *Ammophila arenaria*, *Acacia longifolia subsp. Sophorae*, *Leptospermum laevigatum*, *Panicumracemosum* and *Cyperusconglomeratus*. The coastal resources of Newcastle Bight were immediately adjacent, with nearby water sources including the Hunter River, Tilligerry Creek and Moffats Swamp. Past sites identified in the surrounding region predominantly consisted of middens, containing pipis and whelk shells. The report produced by Evans about the skeletal material identified at Stockton Beach was assessed by the Aboriginal Heritage Information Unit (AHIU) as being of a culturally sensitive nature. The AHIU is a part of OEH, being the office

that administers the Aboriginal Heritage Information Management System (AHIMS) register. As the report was considered culturally sensitive, it was housed in their special collection as a restricted item, able to be viewed only with special permission from the AHIU.

**Resource Planning Pty Ltd. 1994. Archaeological Survey Part Lot 16, DP 258848 Fern Bay, NSW. Report to Howship Holdings Pty Limited.**

Resource Planning Pty Ltd (1994) undertook an archaeological survey to assess the likely impact of development of the archaeological resource of Lot 16, DP 258848. This area of land had previously been identified for conservation in an environmental assessment due to its wildlife conservation value. A part of Lot 16, DP 258848 however was given the proposed rezoning 1 (d) Rural (future investigation). It was this section of Lot 16 that comprised the study area for this report. The study area was located to the northeast of the Fern Bay township, on the eastern side of Nelson Bay Road and was approximately 40 hectares in size. The topography comprised a dual barrier dune system consisting of an outer barrier and an inner barrier. The study area was situated on the inner margin of the outer barrier in association with 4500 BP transgressive dunes. Vegetation in the study area consisted of swamp forest and dry sclerophyll forest on steep sided transgressive sands with Angophera costata, Eucalyptus pilularis and Banksia serrata. A search of the NPWS sites register identified two previously recorded sites within the study area. One of these sites, 38-4-0134, was not able to be located on the survey. A third previously recorded site was identified in a 1992 report by Dean-Jones referred to as Fern Bay 8. It was concluded that Fern Bay 8 was the same as the second AHIMS registered site in the area, being 38-4-0135. Along with a site called Fern Bay 7, the site Fern Bay 8 was assessed to be on the perimeter of the swamp forest; neither of these sites was located during the survey. Based on the previous recordings and a study of past reports relating to the area it was concluded that middens, open campsites (sometimes with shell) and burials were the most likely site types to occur in the area. Middens were common site types on the outer barrier, with open artefact scatters rare on the outer barrier but commonly occurring on the Pleistocene barrier. It was considered unlikely that burials would occur in the study area, but possible that scarred trees may occur. A random survey sample of the study area was undertaken and concentrated on areas with high visibility, such as walking tracks and animal tracks. Two sites were located and are summarised below.

Table 12. Summary of sites (Resource Planning 1994)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Site 1 | midden | sandy dune deposit | not noted | swamp | oyster shell | not noted | no |
| Site 2 | midden/ artefact scatter | sandy dune deposit | 50m | swamp | 5 Nobby's tuff artefacts and oyster shell | not noted | yes |

The site types encountered on the survey were of the type predicted; the small number of sites located in the survey may be attributed to the fact that vegetation cover gave low ground surface visibility at the time of inspection. It was recommended that a Consent to Destroy permit be sought for Site 1 and that a Consent to Destroy (with salvage) permit be sought if Site 2 were to be disturbed by the proposed development. Sites located around the periphery of the swamp forest area were considered to be archaeologically significant and it was recommended that they be conserved in a conservation bushland area with walking access only. It was further recommended that should any archaeological material be discovered during development that works cease and the NPWS be contacted.

**Byrne, D. 1994. Archaeological Survey of the Route of MR108 Nelson Bay Road, Newcastle Bight, NSW. Report to Port Stephens Council.**

Byrne (1994) undertook an archaeological survey of an area proposed to be impacted by the MR108 Nelson Bay Road. This road was a proposed dual carriageway designed to supersede then existing sections of Newcastle Bay Road between Salt Ash and Bob's Farm on Newcastle Bight. Apart from oyster leases there did not appear to have been any high levels of past disturbance in this area. The topography of the area consisted of an outer barrier of stable Holocene sand dunes. The study area was located two to three kilometres from the estuarine environment of Tilligerry Creek, with swampy areas located to the northwest of the creek. A thick understorey of vegetation was present within the study area. A search of the NPWS sites register revealed that no sites had previously been recorded within the study area. A review of site types within the vicinity demonstrated that middens were common in the surrounding area. It was predicted that small midden sites, both with or without stone artefacts, were likely to be located in the study area. It was further predicted that midden sites were likely to include material disturbed by deflation during the mobile phase of the now stabilised dunes. The predictive model was accurate in terms of the site types located during survey. Visibility across the study area was very poor, 0-5%, with some places not walked due to the thick understorey of vegetation. Two sites were identified and are summarised in Table 13.

Table 13. Summary of sites (Byrne 1994)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Nelson Bay Road #1 | midden | dune crest | not noted | not noted | shell | not noted | yes |
| Nelson Bay Road #2 | midden | level area between 2 dunes | not noted | not noted | shell | not noted | yes |

Due to very poor ground surface visibility at the time of inspection it was noted that further archaeological material may exist in the area. It was recommended that an archaeologist carry out subsurface investigations at both of the identified sites. It was further recommended that monitoring be carried out during construction work. Should burials or any other sites of high archaeological value be discovered during monitoring it was stated that works must cease and NPWS and the Local Aboriginal Land Council be notified and an assessment made.

**Effenberger, S. 1996. Archaeological Monitoring Report Mineral Sand Mining Lease Tomago near Masonite Road Port Stephens LGA, NSW. Report to RZM Pty Ltd.**

Effenberger (1996) undertook an archaeological assessment of a 6-hectare study area proposed for mineral sand mining. The land was triangular in shape, situated between Deep Swamp and Blind Harrys Swamp. The topography of the study area consisted of an inner margin of Stockton Bight barrier dune system and Tomago sand beds north of Fullerton Cove. The low-lying wetlands area and stabilised sand sheets contained vegetation including Smooth-barked Apple, Swamp Mahogany, Broad-leaved Paperbark, Red Bloodwood, Banksia species and Scribbly gum. Disturbance to the study area included the removal of an entire substrate, which had been mined, sieved and then replaced. No reference is made to a search of the NPWS sites register however an examination of past reports referring to the general area identified the most likely site types to be located in the study area that included shell midden complexes, artefact scatters (Holocene & Pleistocene dunes), scarred trees, Euro-middens, burials and quarries. The survey focused on ground surface visibility and mature trees were inspected for scarring/carving. One previously recorded surface scatter site was inspected. Undergrowth vegetation lessened ground surface visibility, making the survey ineffective in terms of both coverage and sampling. No new sites or areas of PAD were identified. Effenberger recommended that prior to the proposed works taking place the study area be subjected to an assessment of cleared ground by a qualified archaeologist or WLALC representative. The previously recorded site that was assessed during this inspection was recommended to be the subject of a Consent to Destroy permit application. It was further recommended that employees of RZM be made aware of the legislation protecting archaeological material and should any be discovered during works that construction cease and the Sydney Zone Regional Archaeologist be contacted. Finally, a systematic appraisal of previously undisturbed land was recommended under a Preliminary Research Permit with a program of subsurface sample testing.

**ERM. 1998. Nelson Bay Road Segment 8 Archaeological Report. Report to Port Stephens Council.**

ERM Mitchell McCotter (1998) undertook an archaeological assessment of a section of the proposed route for the Nelson Bay Road upgrade. The study area was 2.9 kilometres in length and ran parallel to Stockton Bight and through the hind dunes of the Stockton Bight dune system. It was proposed to construct a dual carriageway along this proposed route and this survey followed on from an earlier inspection by Byrne in 1994 as well as vegetation clearance in March and April of 1998. It was noted that the testing recommended by Byrne in his report had not occurred and that further midden

sites were identified in the area by a WLALC sites officer in January 1998, necessitating this further archaeological assessment. The topography of the study area consisted predominantly of a barrier dune system of Holocene sand dunes. At the time of inspection, the three kilometres long study area had been cleared of vegetation and the initial form of the road lain with underlying clean sand. Nearby swampy areas comprised the closest water source and vegetation in the area consisted of a eucalypt forest. In the background review of the area it was noted that the two midden sites previously recorded by Byrne were not in the NPWS register and that no other previously recorded sites were identified within the study area. A search of the NPWS register did however demonstrate a range of sites in the surrounding area. Sites in the Stockton Bight area included 16 open camp sites (four with middens), 75 middens, three burials, two isolated finds, six scarred trees, one grinding groove, three shelters and one quarry with an associated midden. No predictive model was included in this report. As well as resurveying the study area, test probes were utilised to determine the extent of site locations that were identified. A total of 14 sites were recorded, including those that had been identified previously by Byrne and WLALC. No separate areas of PAD were identified. The 14 sites are summarised in Table 14.

Table 14. Summary of site (ERM 1998)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Nelson Bay Road 1 | midden | dune crest | not noted | not noted | shell | not noted | yes |
| Nelson Bay Road 2 | midden | level area between 2 dunes | not noted | not noted | shell | not noted | yes |
| Nelson Bay Road 3 | midden | not noted | not noted | not noted | shell/char coal | High | no |
| Nelson Bay Road 4 | midden | not noted | not noted | not noted | shell/char coal | High | no |
| Nelson Bay Road 5 | midden | not noted | not noted | not noted | whelk, cockle, pipi and oyster shells | High | no |
| Nelson Bay Road 6 | shell scatter | not noted | not noted | not noted | pipi fragments and 1 whelk | not noted | not noted |
| Nelson Bay Road 7 | midden | not noted | not noted | not noted | cockle & whelk shells | High (tree removal) | not noted |
| Nelson Bay Road 8 | shell scatter | not noted | not noted | not noted | pipi fragments | Moderate (track & clearing) | not noted |
| Nelson Bay Road 9 | midden | not noted | not noted | not noted | cockle & whelk shells | High (tree removal) | not noted |
| Nelson Bay Road 10 | shell scatter | inter dunal ridge | not noted | not noted | pipi & Janthina shell | not noted | not noted |
| Nelson Bay Road 11 | shell cluster | not noted | not noted | not noted | cockle & whelk shells | High (tree removal) | not noted |

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| Nelson Bay Road 12 | scarred tree | ridge | not noted | not noted | notched tree – Blackbutt (*Eucalyptus pilularis*) | not noted | not noted |
| Nelson Bay Road 13 | scarred tree | not noted | not noted | not noted | Scarred tree with fire damage – Rusty gum (Angophora costata) | not noted | not noted |
| Nelson Bay Road 14 | midden | not noted | not noted | not noted | cockle, pipi & whelk shells | High (roadworks & site shed) | not noted |

It was recommended that a consent to destroy permit be applied to midden sites 1 to 5 and 7 to 11. Sites 2 and 14 were noted as already having been destroyed and the Nelson Bay 6 site was cited as being outside the area of impact. The scarred tree sites 12 and 13 were noted as outside the area of proposed works but were recommended to be marked and protected from any disturbance. Due to the potential for further buried midden material or human remains in the area it was noted that work should cease immediately and NPWS be contacted should anything further be uncovered during the proposed works.

**Dallas, M., and Mitchell, P.1999. Archaeological Survey of Proposed Golf Club at Medowie, NSW. Report prepared for Port Stephens Golf and Country Club Pty Ltd.**

Dallas and Mitchell (1999) undertook an archaeological assessment of an area proposed for development as a golf and country club at Medowie Road, Medowie. The study area comprised 68.5 hectares and was described as part Lot 2 DP540523. The development proposal included an 18hole golf course and club facilities. Past impacts in the area included vegetation clearance, drain excavation, residential subdivision and sand mining. Landforms of the study area consisted of low-lying wetlands and modified sand flats. The inner or back barrier sands in the study area were Pleistocene in age and stretched from Tilligerry Creek to Raymond Terrace and Hexham. Vegetation in the area included swamp mahogany, broadleaved paperbark, couch, whiskey grass, fireweed, cats ear, smooth barked apple and Sydney golden wattle. A search of the NPWS register identified five previously recorded sites within the bounds of the study area and known sites in the region included coastal and estuarine shell middens, artefact scatters, burials and scarred trees. Middens were the most commonly occurring site type along the coast and along the foreshores and it was predicted that artefact scatters were the site type most likely to occur within the study area, with isolated artefacts, burials and middens also possible to occur. These predictions proved accurate with artefact scatters and isolated artefacts identified. The five previously recorded sites (four artefact scatters and one isolated artefact) were relocated and two additional sites were identified, one artefact scatter (4 artefacts) and an isolated artefact, both located in spoil and highly disturbed.

**ERM. 2003a. Electricity Supply Upgrade from Tomago to Tomaree. Indigenous Cultural Heritage Assessment. Report to EnergyAustralia.**

ERM (2003a) undertook an identification of impacts in relation to known and recorded archaeological sites as part of an Environmental Impact Statement (EIS) for EnergyAustralia. This covered the proposed upgrading of electricity powerlines from Tomago to Tomaree and on the associated access road from Salt Ash to Tomaree. Various vegetation communities were identified along the proposed routes, including apple-blackbutt, bitou bush, swamp mahogany, broad-leafed paperbark, sedges, swamp oak, salt water couch, melaleuca, casuarina, hakia, banksia, stunted red bloodwood, smooth-barked apple, kikuyu, grasses, purpletop, blackberry, fireweed, dock and bracken. The main water sources in the area were Tillegerry Creek and Fullerton Cove. Past land uses included clearing, agriculture, horse and cattle grazing and breeding, deer farms, hobby farms, mining and quarrying. The Tomaree National Park also stretched along the coastline from Tomaree Head, south to Anna Bay. Based on a review of past studies in the area and a search of the NSW NPWS Aboriginal Sites Register a predictive model was compiled. It was predicted that campsites may occur in the area with hearths and/or artefact scatters containing stone and shell. Other site types predicted to possibly occur included scarred/carved trees, middens and burials. Scarred/carved trees were predicted to occur where clearing had not occurred. Although the presence of burials in the area could not be dismissed it was predicted that the likelihood of discovering any was minimal. The predictive model proved accurate as a mix of artefact scatter/isolated find and midden sites were located. The survey was broken up into geomorphological land forms, consisting of Pleistocene Dunes, Inter barrier depression and the Holocene Dunes. Ten new sites were identified and are summarised in Table 15.

Table 15. Summary of sites (ERM 2003a)

| Site Name | Site type | Landform | Distance to Water | Stream Order | Artefacts/ Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| 38-4-0647 (A1) | artefact scatter/ midden | dune slope | 6m | swamp | 29 microliths, cockle/ oyster/pipi | clearing, grazing and easement | moderate to high |
| 38-4-0648 (A2) | artefact scatter/ midden | dune slope | 5m | swamp | 3artefacts, cockle, oyster/pipi | cattle grazing and easement | moderate |
| 38-4-0649 (A3) | artefact scatter/ midden | Hill slope | not noted | not noted | artefacts and shell | easement, access track, path, grazing | moderate |
| 38-4-0643 (A4) | artefact scatter/ midden | dune crest/dune slope | not noted | not noted | 115 artefacts, shell, bone | easement and grazing | high |
| 38-4-0650 (A5) | midden/ artefact scatter | dune | 600m | swamp/ lagoon | artefacts, shell | driveway and power poles | high |
| 38-4-0651 (A6) | midden | dune crest | not noted | not noted | various shells | access road, WWII tank traps | moderate |
| 38-4-0652 (A7) | midden | dune crest | not noted | not noted | various shells | access road, WWII tank traps | moderate |
| 38-4-0653 (A8) | midden | not noted | not noted | not noted | various shells | erosion | moderate |

| Site Name | Site type | Landform | Distance to Water | Stream Order | Artefacts/ Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| 38-4-0664 (A9) | isolated find/ midden | dune slope | not noted | not noted | broken flake with usewear, shell pieces | erosion, burnt tree | low to moderate |
| 38-4-0676 (A10) | midden/ artefact scatter | dune slope | 6m | swamp | 9artefacts, cockle, mud oyster shell, fish/lizard/ bird, kangaroo bone | agricultural clearing and cattle grazing | moderate to high |

In addition, 5 previously recorded sites, 38-4-0313, 38-4-0485, 38-4-0658, 38-4-0660 and 38-4-0661 were relocated and seven PADs also identified, two located on the Inner Pleistocene barrier system and five on the Holocene Barrier System. ERM concluded that the proposed works would impact on a number of sites (38-4-0649, 38-4-0650, 38-4-0664) and all the identified PADs. Recommendations included mitigation measures to protect those sites that could be preserved from damage or destruction as a result of the proposed works. It was recommended that EnergyAustralia undertake test excavations on PADs 1 to 7 and that the following sites be fenced with a buffer zone: 38-4-0647, 38-4-0676, 38-4-0664 and 38-4-0643. It was also recommended that sites 38-4-0468 and 38-4-0649 be preserved by the most appropriate method (such as by covering the site with biodegradable netting, sand and grass). A partial consent to destroy permit was recommended for 38-4-0650. The following sites were recommended for both fencing and conservation through methods such as biodegradable netting, sand and grass coverings: 38-4-0659, 38-4-0660, 38-4-0661, 38-4-0313 and 38-4-0485.

**ERM. 2003b. Electricity Supply Access Road – Tomago to Salt Ash. Indigenous Cultural Heritage Assessment. Report to EnergyAustralia.**

ERM (2003b) undertook an archaeological assessment for a proposed access road from Tomago to Salt Ash. The general route of the road was known at the time of investigation, but the exact location was subject to change necessitating that the survey included a number of alternative routes. The study area included areas from the existing Tomago substation and extended east through the Pleistocene dunes, the Inter Barrier depression, the Holocene dunes and ended at Salt Ash. EnergyAustralia proposed to construct a 5m wide continuous road along the route, running to a length of approximately 16km. Access points from the road to each pole for substation line construction and maintenance were also required. Other proposed works included laying geotextile fabric, laying car and truck tyres, filling and capping with crushed rock/recycled concrete, depositing sand and spreading grass seed. The proposed access road was predominantly placed through disturbed pasture grassland, containing kikuyu, couch, dock, blackberry, fireweed and purpletop. Other vegetation was noted in occasional patches and included: swamp oak, salt water couch, sedges, smooth-barked apple, blackbutt, red bloodwood, bracken fern and wallum banksia. Lantana was noted in some areas, and alligator weed infestations were noted in association with drainage lines. The main water sources were Tillegerry Creek and Fullerton Cove with a series of floodgates, tidal flaps, drains and levees occurring along the drainage network. Past disturbances included agriculture, horse and cattle grazing and breeding, deer farms, hobby farms and residential development. A search was undertaken of the NPWS AHIMS register, showing 91 Aboriginal sites to have been registered within the Tomaree peninsula. These included 54 middens, 26 open campsites, five scarred trees, one burial, one shelter with art, one shelter with midden and three

isolated finds. Seven middens and eight sites recorded by ERM in 2002 (not yet on the AHIMS register) were also taken into consideration. A predictive model was compiled based on previous heritage studies and the AHIMS results. The predictive model stated that the site types most likely to occur throughout the Pleistocene and Holocene portions of the study area were campsites, scarred trees, middens and burials. The most likely types were middens and campsites; burials were considered unlikely and scarred trees were only possible in areas that had not been cleared. No sites were expected to be found in the interbarrier depression portion of the study area. A total of six sites were recorded on the survey, two of which (A2 and A4) were avoided on the final route for the proposed road. The predictive model proved accurate as the site types encountered were all artefact scatter/isolated find and midden sites. The sites that were identified are summarised in Table 16.

Table 16. Summary of sites (ERM 2003)

| Site Name | Site type | Landform | Distance to Water | Stream Order | Artefacts/ Features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| 38-4-0647 (A1) | artefact scatter/midden | dune slope | 6m | swamp | 29 microliths, raw materials, cockle/oyster/pipi shells | Clearing, grazing and easement | moderate to high |
| 38-4-0648 (A2) | artefact scatter/midden | dune slope | 5m | swamp | 3 microliths and cockle/oyster/pipi shells | cattle grazing and easement | moderate |
| 38-4-0649 (A3) | artefact scatter/midden | hillslope | not noted | not noted | artefacts and shell | easement, access track, path, grazing | moderate |
| 38-4-0643 (A4) | artefact scatter/midden | dune crest/dune slope | not noted | not noted | 115 artefacts, shell and bone | easement and grazing | high |
| 38-4-0664 (A9) | isolated find/ midden | dune slope | not noted | not noted | Broken flake with usewear and shell pieces | Erosion, burnt tree | low to moderate |
| 38-4-0676 (A10) | midden/artefact scatter | dune slope | 6m | swamp | 9 microliths, cockle and mud oyster shell, fish/lizard/bird/kangaroo bone | agricultural clearing and cattle grazing | moderate to high |

In addition, one PAD was also identified on the inner Pleistocene dune. ERM concluded that the proposed development would involve minimal changes to the current landscape. The proposed works would avoid sites A2 and A4; PAD1 and part of A3 and A9 would be impacted by

construction and maintenance. Sites A1 and A10 were to be protected. Recommendations included subsurface testing in PAD1, fencing sites A1, A3, A4, A9 and A10 including a buffer for their protection. A partial consent to destroy was recommended to cover those areas of A3 and A9 that would be affected by construction.

**MCH. 2003. Reposed residential subdivision development along Mount Hall Road, Raymond Terrace. Survey Report. Report to Project Plan.**

MCH completed an assessment for a Development Application for the proposed residential subdivision along Mount Hall Road at Raymond Terrace. The study area includes Lot 2 DP 8584853 and Lot 2 DP 787819. The study area was situated on the far northwest of the Pleistocene dunal system and was generally flat with a slight gentle slope (one metre) towards the far south that dropped (10 metres) to a natural drainage channel (approximately 30 metres south of the study area) and the Grahamstown Drain further south. The major water sources surrounding the study area include the Hunter River located approximately two kilometres west and Grahamstown Lake located about 1.5 kilometres east. Additionally, the Grahamstown Drain and natural drainage lines are located approximately 30 metres south of the southern end of the study area, and swamps occur throughout the wider surrounding area. European clearing and pastoral uses have occurred on the study area. Present day land uses surrounding the study area include a dirt road immediately to the west, residential developments and associated infrastructure to the north and east, and the Pacific Highway to the west. The regional and local environment provided a range of resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area. Located between two major watercourses and natural drainage areas to the immediate south, it is expected that the study area would have provided a travel route and possibly areas of occupation. A search of AHIMS identified 32 known Aboriginal sites are currently recorded within six kilometres surrounding the study area and included 2 middens, 20 open campsites, 3 isolated finds, 2 shelters with deposits, 1 quarry, 1 burial and open camp, 2 burials and 1 bora/ceremonial ground. Review of the AHIMS results and local assessments indicated that occupation focussed on the dune areas overlooking the interbarrier depression. Proximity to water was clearly an important factor, with sites running along the length of dunes, at times in clusters on consecutive dunes (although this may be due to sampling and the area surveyed). Sites reduce in number significantly away from the interbarrier depression between the Holocene dunes towards the coast, and increase again along the coast. The lack of sites from Anna Bay to Nelson Bay, during previous studies, may be due to any number of reasons including survey sampling, vegetation cover, distance from water or other cultural and environmental constraints. The northern half of the study area (approximately 32,500m$^2$) consists of flat, previously cleared pasture that had limited visibility in those areas and no exposures were present. The southern half of the study area (approximately 37,500m$^2$) consisted of a gentle slope (<3%) and area is covered with a dense cover of tree, grass and leaf litter cover that has limited visibility. One highly disturbed shell midden was identified spread out over approximately 40 metres and included oyster, cockle shell, animal bone pieces and a tuff flake. A PAD was also identified and included the southern portion of the study area that included the gentle slope and decline towards the water drainage area. MCH recommended test excavations of the PAD and a s90 for the shell midden.

**Umwelt Australia Pty Ltd. 2003. Aboriginal Archaeological Survey and Assessment of Part Lot 5, Stockton Rifle Range, Fern Bay. Report to GDH Pty Ltd.**

Umwelt (2003) investigated an area of Commonwealth land located in a coastal environment, associated with Stockton Bight to the north of Newcastle, NSW. The land was proposed for future sale and development and the investigation was undertaken to identify Aboriginal Archaeological locations of sensitivity within the study area. The area had previously been used as a firing range,

with roads, mounds, houses, coastal scrub and dunes in the surrounding vicinity. The topography of the study area included a Holocene relict beach ridge. Modifications had occurred to the dunes in the vicinity of the firing range, including levelling, the construction of buildings and tracks, as well as the erection of stop butts and targets. Marine and freshwater deposits of gravel, sand, silt and clay predominated the study area. The firing range had been cleared with vegetation within its bounds consisting of grasses and weeds. Other vegetation in the area included smooth barked apple, blackbutt, coastal Banksia) coastal tea tree, bitou bush, turpentine, mother of millions, slender rice flower, bracken fern and purple top. A search of the AHIMS register covering an area up to 5 km surrounding the study area identified 62 sites, including 36 midden sites, 18 artefact scatters, five middens with artefact scatters and three isolated artefacts. No previously recorded sites were located within the bounds of the study area. A predictive model based on past surveys in the area and the AHIMS results listed middens, artefact scatters and isolated artefacts as the site types most likely to be located within the bounds of the study area. Considering past disturbance in the area small artefact scatters and shell fragments on the surface in areas of exposure were predicted as most likely to be encountered during the survey. Thick vegetation was noted in some areas during the survey and areas of exposure were targeted for inspection. Two artefact scatters were identified, one on a beach ridge crest and slope (7 artefacts and fragments) and the second on a modified landform (4 artefacts). It was recommended that there were no archaeological constraints within the study area as it was highly disturbed and of low archaeological significance. It was noted however that the area was cited as highly significant to the WLALC and WTAE&OG.

**MCH. 2004a. Reposed residential subdivision development along Mount Hall Road, Raymond Terrace. Test excavation Report. Report to Project Plan.**

MCH (2004a) undertook test excavation of the previously identified PAD located at Lot 2 DP 8584853 and Lot 2 DP 787819 for a Development Application for the proposed residential subdivision along Mount Hall Road at Raymond Terrace. For comparability and continuity across the site, all test pits were two x one metres. Nine pits were located to determine the extent of cultural material across the hill slope and crest areas and the degree of any disturbances. Burnt and decaying organic material was found distributed throughout all pits, with the highest density of material in the upper levels indicating that fires have passed through the area. All pits were subject to heavy root disturbance in the upper levels that decreased with depth. The upper levels were characterised by rootlets and roots less than one centimetre in diameter with some up to two centimetres in diameter. The largest roots, most approximately five centimetres in diameter, were found primarily at a depth of between 25 and 45 centimetres below surface. Insect disturbance was noted in all pits though to varying degrees. Insects observed include bot fly larvae, mealy worm, earthworms and Christmas beetle larvae. The site was considered to be part of RT1, identified during the initial survey. The eastern and western extent of the site was unknown as the boundary of the study area cuts through these sections of the site. The northern extent of the site appeared to be a maximum of 50 metres north of the boundary of the crest and adjoining slope. The southern boundary appeared to be a maximum of the base of the slope which is also the boundary of the study area. All excavated archaeological materials were stone artefacts. Eighty-eight artefacts were recovered and raw materials included tuff, silcrete, quartzite and possibly chalcedony and artefact types included flakes, flake fragments, flaked pieces and a possible hammerstone. MCH recommended salvage excavations of the site.

**MCH. 2004b. Reposed residential subdivision development along Mount Hall Road, Raymond Terrace. Salvage excavation for site RT1 NPWS # 38-4-0694. Report to Tattersall Surveyors Pty Ltd.**

MCH (2004b) undertook the salvage of RT1 located at Lot 2 DP 8584853 and Lot 2 DP 787819 for a Development Application for the proposed residential subdivision along Mount Hall Road at Raymond Terrace. Two 2m x 1m excavations were undertaken (Labelled Raymond Terrace / Salvage

1 and 2: RT/S1 and RT/S2). The depth of the excavation (1.5 metres) dictated that the excavation had to be undertaken in a stepped format such that, for every 30 cm of vertical excavation, a 50cm wide 'step' was left to surround the full extent of the trench. This involved starting with an area of six metres by seven metres (all one metre by one metre quadrants and 50 centimetres by 50-centimetre quadrants labelled), excavating in one metre quadrants at 10-centimetre spits to a maximum depth of 30 centimetres. Then the excavation area was reduced by 50 centimetres around the perimeter as the next step was excavated in 10-centimetre spits to a maximum depth of 30 centimetres, and so on. The salvage resulted in 119 artefacts recovered and were manufactured from tuff, silcrete, mudstone, quartzite, chert and chalcedony and included flakes, flake pieces, cores and backed artefacts. Two small fragments of shell and four individual pieces of bone were located during excavation however, due to the deterioration of these remains, they were unable to be identified.

**MCH 2004c. Proposed sewerage pipeline, Fern Bay. Indigenous Cultural heritage Assessment. Report to Hunter Water Australia.**

MCH (2004) undertook an assessment for the proposed sewer and pumping station located throughout the township of Fern Bay. The study area was situated within the Holocene stabilised dunes and includes well-rounded dunes and the associated deflation basin formations. Tilligerry Creek was a prominent drainage line running southwest to northeast in the inter-barrier depression area. Runoff occurred via Fullerton Cove to the west or Tilligerry Estuary to the east. A system of floodgates, tidal flaps, drains and levees occurs along the drainage network from Fullerton Cove to Tilligerry Creek. The primary water source immediately to the west of the study area is the Hunter River. This area is rich in water resources and as such would have been a prime location for past occupation. A search of the AHIMS register identified 55 known Aboriginal sites/artefact finds recorded within a ten-kilometre zone around the study area and included 12 open campsites, 2 Natural Mythological, 5 midden/open camps, 1 isolated find, 9 sites featuring artefacts[1], 10 artefact/shell, 12 midden, 1 shell. One unidentified site (restricted) was included although due to the restriction the site type and location is unknown, and three PADs (Potential Archaeological Deposits) were included. MCH found that there was a high potential for archaeological sites on the entire landward margin of the stabilised mid-Holocene dune field and the deflation basin and inner margin of the active transgressive dune field. Sites are typically middens (composed of estuarine and/or marine shell species) and open camps, with sparse scattering of archaeological material along the ridgelines of the dunes and high-density sites appearing on low flat ridgelines immediately adjacent to wetland areas. Within the specific study area, it was predicted that there was a high potential for evidence of past occupation, specifically artefact scatters, shell middens and burials. Shell midden material and artefacts were identified throughout the project area and due to the high potential for burials, the project area was subject to GPR. The results of the GPR survey indicated that borehole sites 7, 14, 17, 24, 25, 26 and 27 should be excavated by hand as the results are inconclusive for burials. Additionally, an anomaly was identified approximately 40-60 centimetres east of the east-west transverse line at borehole 28. Although this probably represents a modern service line, it is suggested that the borehole should be moved 20 centimetres further to the west of the present location. The anomaly can then be investigated in more detail during Stage Two of the project. MCH recommended test excavations at the proposed geotechnical hole locations.

**Umwelt (Australia) Pty Ltd. 2004. Research Design and Methodology to Accompany DEC Section 87 and Section 90 Permit Applications for Stage 2 Investigations and Site Conservation Works for the Tomago to Tomaree Electricity Supply Upgrade Project. Report to EnergyAustralia.**

Umwelt (Australia) Pty Ltd (2004) compiled a Research Design and Methodology report that related to five sites and four PADs identified by ERM in 2003 in relation to the Tomago to Tomaree Electricity Supply Upgrade project. In addition to the sites and areas of PAD, this report also referred to three

areas along Nelson Bay Road which had mounds of shell material removed by the RTA during road works from 10 sites located in that area. The shell material removal was undertaken in consultation with Worimi Local Aboriginal Land Council and NPWS Aboriginal Sites Officers; these works resulted in the collection of very small amounts of shell material. All of the sites/PADs and shell mounds were located within the Outer Holocene Barrier System, situated between Tomago and Tomaree. The Research Design also extended to three sites and a PAD that had been previously investigated and salvaged, located within the Inner Pleistocene Barrier System at the western end of an easement that was due to be impacted by Stage 1 of the proposed project. It was proposed as part of Stage 2 to undertake conservation works to protect and conserve part of Site A3 (#38-4-0649) and Boyces Track 1, and to conserve all of Sites A4 (#38-4-0643), A5 (#38-4-0650) and A9 (#38-4-0664). Conservation works were further planned for the three areas where shell material was pushed into mounds on the southern side of Nelson Bay Road. Subsurface salvage was proposed for Sites A3 and Boyces Track 1 and subsurface investigations recommended for various pole locations throughout locations PAD3 and PAD4. The purpose of these investigations was cited as being to identify if artefactual material existed in these areas and what the Aboriginal and archaeological significance of that material (if any) might be. The project area was within the Newcastle Bight Sand Barrier System, including an Inner Pleistocene Barrier System, an Outer Holocene Barrier System and an Interbarrier Depression. Inland dunes were noted to have been stabilised with vegetation, with coastal dunes remaining destabilised and transgressive. The Interbarrier Depression divided the barrier systems and at the time of the inspection was filled with estuarine and freshwater deposits. The geology of the area consisted of sands, silts and clays. To the southwest the Quaternary deposits were underlain by tuff, shale, conglomerate, sandstone, and coal. Vegetation in the areas of low gradient shoreline had been extensively cleared for cattle grazing and at the time of inspection were covered with couch grass, vegetation in the interbarrier depression area included stands of swamp oak, tea-tree, water ribbons, spike rush, sword-sedge and bulrush. The Outer Holocene dune system contained a Coastal Sand Apple-Blackbutt Forest with tea-tree, bracken fern, running postman, banksia, kangaroo grass, flax lily, native cherry and bungwall. This report did not conduct an AHIMS search as the intention of the report was to provide a research design and methodology for an existing area containing known sites. The previously recorded sites whose research design and methodology were detailed in this report included the following: A3 #38-4-0469 (incorporating PAD2); A4 # 38-4-0643; A9 # 38-4-0664; A5 #38-4-0650; PAD3; Boyces Track 1; PAD4 (western end); PAD4 (eastern end); #38-4-0402; #38-4-0478; #38-4-0479; #38-4-0480; #38-4-0481; #38-4-0483; #38-4-0484; #38-4-0485; #38-4-0491; 38-4-0492; PAD5 and Stored Shell Material.

The research design attempted to focus on questions of interest to the Aboriginal community, aimed toward supporting oral history in relation to how Aboriginal people used the Pleistocene and Holocene Barrier Systems. The research design related to the broader research parameters of the entire salvage/investigation program, and asked such questions as what resources were available in the area, what resources were transported in and from where, how stone artefact/shellfish/faunal assemblages differed between the Inner Pleistocene Barrier System and the Outer Holocene Barrier System, what tasks were undertaken at the sites, were areas used at different times of the year, was heat treating taking place, were burials in either area and were Aboriginal people using the Inner Pleistocene Barrier System in the Tomago area earlier than the mid to late Holocene? Methodology was tailored to each site location and included such works as implementing an access road atop the ground surface to avoid subsurface impacts, undertaking subsurface investigation in pole location areas excavated in squares either stratigraphically or in 5cm spits with all material sieved through a 2mm mesh. A full analysis of stone material was to be undertaken for any artefacts located during these works. Detailed site recordings were also to be undertaken and in areas where sites could be avoided, they were in some cases to be fenced for protection. Surface collection and subsurface salvage were to be used as a consistent approach to numerous locations in the areas of impact. Protection of shell mounds was to be undertaken by covering them with mulch derived from the

vegetation clearance and temporarily fenced for the period of pole emplacement. Following the completion of the Stage 2 salvage and conservation works, it was proposed that DEC be informed and a single report be produced to cover the results of Stage 1, 2 and possibly 3 of the investigation and salvage work. As this report detailed the research design and methodology only, the results of these proposed works are included in a separate report.

**Wild Thing Environmental Consultants. 2004. Aboriginal Archaeological Heritage Impact Assessment for the proposed Aged Care Development at Lot 187 DP 749482 (No. 160) Fullerton Cove Road, Fullerton Cove, NSW. Report to Craig McGaffin, Buildev Group.**

Wild Thing Environmental Consultants (2004) undertook preliminary Aboriginal Heritage studies of a 26-hectare area of land identified as Lot 187 DP749482 (No. 160) Fullerton Cove Road. At the time of inspection, the study area was designated as rural agricultural land and had been utilised for grazing. In addition to stock grazing and vegetation clearance the central portion of the study area had been impacted in the past by the laying of fill. The area had previously been swampy in nature and the deposition of fill had adapted the low-lying areas for stock grazing purposes. Rubbish dumping had also been undertaken in the area. The northern portion of the study area adjoined rural residential blocks. The proposed works included the construction of 238 self-contained units with ancillary facilities and services, including community centre, picnic area and swimming pool. The topography of the study area was a flat area on the western side of Nelson Bay Road with a small rise in the north-western corner and a drainage easement in the central portion running from east to west. Vegetation at the time of inspection was predominantly composed of grasses used for pasture, but other vegetation types included mangroves and casuarinas with Swamp Mahogany and Paperbark Swamp Forest dominating the northern and southern ends of the study area. Other species identified during the survey included Broad-leafed Paperbark, Prickly-leafed Paperbark, Swamp Paperbark, Forest Red Gum, Swamp she-oak, Swamp Mahogany, as well as couch, buffalo grass, Kurnell Curse, River Buttercup, Lantana, Blackberry, Bracken, Rasp Fern and Scotch Thistle. Three small dams were located in the study area and other sections were noted as being waterlogged at the time of the survey. A search of the NPWS Aboriginal sites database revealed 49 sites within a five-kilometre radius of the study area, including 19 midden sites, 11 open camp sites, five midden/open camp sites and 14 isolated finds. Based on these search results and reference to past archaeological survey in the area a predictive model was compiled stating that Aboriginal activity in the study area would have consisted of the general activities of a hunter gatherer lifestyle; middens may occur in this area with the possibility of associated hearths. Artefact scatters and isolated finds may be encountered but scarred trees were not expected to occur due to vegetation clearance. It was also stated that the area may have cultural significance associated with the presence of waterholes. One moderately disturbed shell midden/artefact scatter was identified and included oyster shell, mudstone flakes (9) and 4 cores. The site type conformed with the predictive model that had been compiled for the area and it was posited that poor archaeological visibility encountered during the survey as well as past disturbance in the area may have accounted for only one site being recorded. Large deposits of Sydney Rock Oyster, Mud Whelk and Cockle Shell were located along the extent of the western boundary as well as in the south-western corner of the study area. It was recommended that all cultural material from the Fullerton Cove Site 1 midden site be collected by WLALC and relocated within the area of Swamp Forest, a section of the study area that was to remain relatively undisturbed. It was noted that these activities would require a Section 90 Consent to Salvage application to be prepared by an archaeologist in consultation with WLALC.

**ERM. 2005a. Tanilba Bay to Oyster Cove Electricity Easement Cultural Salvage. Report to Enerserve.**

ERM (2005) were engaged to undertake a cultural salvage at Oyster Cove, NSW. The cultural salvage works included the collection of artefacts from two artefact scatter and two isolated find sites. These sites had been identified as being directly impacted by two proposed 33kV transmission feeders to run between the existing Salt Ash substation and a new Tanilba Bay substation. In addition to surface collection, ERM also undertook limited excavation (involving eleven hand auger pits) in accordance with the conditions of Heritage Impact Permit #2111. As this report contains only details of the results of the cultural salvage it does not include background data on NPWS searches, landform, topography or predictive modelling; these were all included in previous reports referring to this area. A total of 21 artefacts were collected on 15 and 16 September 2005. These artefacts were all located during surface collection and no additional artefacts were located in the hand auger pits. The previously recorded sites that were salvaged comprised of Oyster Cove Site 1, Oyster Cove Site 2, Oyster Cove Site 3 and Tanilba Bay 3. All conditions of the #2111 permit were met through these cultural salvage works.

**ERM. 2005b. Fern Bay Estate Aboriginal Heritage Assessment Report. Report to Winten Property Group & Continental Venture Capital Limited.**

ERM (2005) undertook archaeological excavations of Lot 16, DP 258848, No. 85 Nelson Bay Road, Fern Bay. This report followed on from an interim report on excavations completed for NPWS in July 2001. The study area comprised of approximately 205 hectares of land adjacent to and to the east of Nelson Bay Road, midway between Stockton Beach and Fullerton Cove. The topography of the study area comprised of naturally stabilised dune systems with interdunal depressions and past disturbances included four-wheel drive vehicle tracks, clearing and excavation work. Three main vegetation communities characterised the area, being apple-blackbutt forest, heath community with mahogany-paperbark forest and swamp sclerophyll forest. A Section 90 consent with salvage was issued by the Department of Environment and Conservation for archaeological sites within the approved subdivision footprint. As this report followed on from earlier reports by ERM (including a Statement of Environmental Effects in 2000) items such as a predictive model and AHIMS search results had already been covered in earlier works and were not included in this report. Mention is made in this report of a predictive model developed by Dean-Jones in 1992 stating that archaeological evidence was most likely to be concentrated on elevated ground in close proximity to freshwater within the inner stable dune. The excavation methodology was outlined with a number of objectives, including working in partnership with WLALC, identifying the extent, nature and significance of archaeological deposits within the study area, ascertaining topographic locations of high archaeological sensitivity, testing known sites and undertaking post-excavation analysis. The following known sites were tested for subsurface deposits during Phase 1 investigations:

- Fern Bay Estate Site 7 - auger testing did not locate any subsurface material;
- Fern Bay Site C - surface collection, augering and test pits uncovered intact A-horizon soils containing high densities of stone artefacts and shell;
- Fern Bat Estate Site 8 – surface collection, augering and test excavation revealed intact A-horizon soils containing low densities of stone artefacts and very low densities of shell;
- Fern Bay Estate Site 11 – test excavation and augering located no archaeological material on ground surfaces or from excavated deposits; and
- Fern Bay Estate Site 16 – artefacts had been located during past test pit excavation, but augering during these works did not locate any further archaeological material.

Phase 2 investigations involved augering along 10 transects. Archaeological material was uncovered in transects 6, 7, 9 and 10. The frequency of archaeological material detected by the auger excavations

was low. In Phase 3 of investigations further test pits were excavated with locations based on the transect results from Phase 2. The site areas excavated included:

- Fern Bay Site D – 84 stone flakes, pieces and cores were recovered from nine spits;
- Fern Bay Site E – 355 shell fragments and 49 stone flakes, pieces and cores were recovered from nine spits; and
- Fern Bay Site F – No archaeological material was found during this excavation (only an isolated find was located during augering).

The new site areas that were identified and excavated as a result of these works are summarised in the table below.

Table 17. Summary of sites (ERM 2005)

| Site Name | Site type | Landform | Distance to water | Stream order | Artefacts/Features | Disturbance |
|---|---|---|---|---|---|---|
| Fern Bay Site D | artefact scatter | low ridge crest | not noted | not noted | 84 stone flakes, pieces and cores | 4WD track |
| Fern Bay Site E | artefact scatter/ midden | low ridgeline | not noted | not noted | 355 shell fragments and 49 stone flakes, pieces and cores | not noted |
| Fern Bay Site F | isolated find | not noted | not noted | not noted | 1 artefact | not noted |

During Phase 3 of works material was also collected from an overburden mound. It was concluded that the test excavations demonstrated that The Fern Bay study area contained a high density of Aboriginal sites, particularly on low ridgelines within the 4000 BP stable dune. Archaeological excavation revealed stone artefacts, shell middens and an Aboriginal hearth, providing information about the social, economic and cultural life of Aboriginal people who lived at Fern Bay prior to European settlement. It was recommended that for future work along the Stockton Bight area that low ridgeline landforms and areas on the margins of swamp forest within Holocene dune sequences be considered of high archaeological sensitivity. Where possible it was recommended that such areas be excluded from development or, if that is not possible, be subject to controlled archaeological excavation.

**MCH 2005. Proposed sewerage pipeline, Fern Bay. Stage one test excavations. Report to Hunter Water Australia.**

MCH (2005) undertook test excavations at a selected number of proposed borehole locations associated with the intended sewerage program at Fern Bay. Based on the results of the initial survey and traditional knowledge, the proposed sewerage scheme was identified as being situated in an area of very high archaeological potential. Subsequent ground penetrating radar investigations were conducted at the borehole locations and identified seven locations where test excavations were necessary and this assessment detailed the results of this investigation. For comparability and continuity across the site as well as the size of the geotechnical investigations, all test pits were one x one metre. All trenches were excavated by shovel and trowel in 10-centimetre spits to approximately one metre, or until collapse occurred, at which point the excavation at that location ceased due to safety. Excavation also halted if the walls of the pit were deemed to be unstable making any further excavation unsafe. This occurred in FB7 and FB24 at depths of 80cm and 90cm respectively. A total of 23 artefacts were recovered from a total of 8 test pits and were manufactured

from tuff and silcrete only. Artefact types included flakes, broken flakes, flake pieces and cores. A relatively large volume of shell material was recovered from FB14 and consisted largely of oyster shell. Unfortunately, based on the generally fragmented samples, it was not possible to clearly distinguish between mud oyster and rock oyster, although, on a basic level, the majority of the shell is that of the rock oyster (*Saccostrea glomerata*) and all species of shell present in FB14 were known to inhabit estuarine environments. Additional test excavations and salvage were recommended.

**Indigenous Outcomes. 2006. An Archaeological Aboriginal Heritage Assessment of the Proposed Industrial Development Tomago Road, Tomago. Report to Asquith & de Witt on behalf of Redlake Enterprises Pty Ltd.**

Indigenous Outcomes (2006) undertook an archaeological Aboriginal heritage assessment of a proposed industrial development located on Tomago Road, Tomago. The study area comprised Lot 161 DP 774440, Lot 1 DP 1003492, Lot 1 DP 597372 and Lot 513 DP 585256 and past disturbances included erosion, residential dwelling, land clearance, low-land development and topsoil removal. The topography consisted of dunes, low lying swamp, wetlands and modified areas. The dunes were of Pleistocene origin with wetlands located between the dunes. The study area was described during the survey as consisting predominantly of floodplain with sandy ridges. Vegetation clearance had removed most of the original vegetation, which would have consisted of angophoras, swamp gums, paperbarks, bloodwoods, banksias, bracken and she oak. Remnants of these vegetation types were present at the time of inspection, with weeping lillypilly and flooded gum also noted in proximity to creek lines. Apart from the swampy areas, the closest water sources were the Hunter River and its tributaries, with the study area located on the Hunter River floodplain. A search of the AHIMS database identified 16 previously recorded sites located within a five-kilometre radius of the study area. These included 13 open camp sites, one midden, two axe-grinding grooves, one shelter with art/deposit and one waterhole/well. It was predicted that open campsites and isolated artefacts were the most likely site types to be located within the study area and that these were most likely to occur along stream channels and on-stream banks. Mid slopes were predicted as unlikely to contain archaeological material and scarred trees were considered unlikely to occur due to extensive past vegetation clearance across the area. The results of the survey tallied with the predictive model in terms of site types (artefact scatters and isolated artefacts), but the most common landform for sites in the study area was found to be sandy terraces. Eight sites were identified (Refer to Table 18) and although no PADs were identified, it was noted that it was very likely that the study area contained areas that could be identified as PADs.

Table 18. Summary of sites (Indigenous Outcomes 2006)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| T1 | artefact scatter | sandy terrace | not noted | swamp | 42 artefacts, flakes, broken flakes, flaked piece, core, possible hammerstones | erosion | not noted |
| T2 | artefact scatter | sandy terrace | not noted | swamp | 1 mudstone flake, 1 silcrete flake, 1 mudstone flaked piece | erosion | not noted |

| Site | Site type | Landform | Distance to water | Stream order | Artefacts/ features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| T3 | artefact scatter | sandy terrace | not noted | swamp | 2 mudstone broken flakes, 1 silcrete flaked piece, 1 mudstone flake | erosion | not noted |
| T4 | artefact scatter | sandy terrace | not noted | swamp | 2 mudstone flakes | erosion | not noted |
| T5 | isolate d find | not noted | not noted | swamp | 1 silcrete flake | erosion | not noted |
| T6 | artefact scatter | mid slope of sandy ridge | not noted | swamp | animal bones, 2 artefacts | erosion | not noted |
| T7 | artefact scatter | mid slope of sandy ridge | not noted | swamp | 61 silcrete, mudstone artefacts | erosion | not noted |
| T8 | artefact scatter | mid slope of sandy ridge | not noted | swamp | 13 mudstone, silcrete artefacts | erosion | not noted |

It was recommended that as the survey results did not provide adequate reason for preventing the proposed development, that it should proceed as planned following the salvage of the identified sites under Consent to Destroy and Permit to Salvage permits. It was stated that salvage could include surface collection and/or the systematic excavation of deposits.

**Umwelt Australia Pty Ltd. 2006. Report to Accompany a Section 90 Consent Application for the Tourle Street Bridge Replacement, Kooragang Island near Newcastle. Report to Roads and Traffic Authority.**

Umwelt (2006) were commissioned to produce a Section 90 consent application for the replacement of Tourle Street Bridge at Kooragang Island near Newcastle. The Tourle Street Bridge spanned the south arm of the Hunter River between Mayfield and Kooragang Island. A previously recorded AHIMS site (38-4-0041) was located in proximity to the proposed works and this Section 90 application was compiled to address it. Umwelt noted that past disturbance in the area was high. Shell midden site 38-4-0041 had been described as heavily bulldozed at the time of recording in 1970. It was stated that any shell deposits still present would be in a highly disturbed context. The site could not be relocated during previous assessments for the proposed bridge replacement project. It was assessed that due to the high level of disturbance within the project area it had no archaeological potential and no further archaeological investigation was required.

**MCH. 2009. Mount Hall Road, Raymond Terrace. Desk top Indigenous Archaeological Assessment. Report to 87 Mount Hall Road Raymond Terrace Unit Trust.**

MCH (2009) undertook an archaeological assessment for the identified land along Mount Hall Road at Raymond Terrace and comprised approximately 18 hectares of land on the eastern side of the Pacific Highway by pass and the southern side of Mount Hall Road. the study area was situated on the far northwest of the Pleistocene dune system (the inner barrier) and was generally flat in the north with a slight gentle slope. Towards the south there was a drop of approximately seven metres

to the swampy floor of a natural drainage channel associated with the Grahamstown Swamp (situated approximately 2.5 kilometres to the northeast). The swamp flat had been extensively modified by deep ploughing and was partly drained by the constructed Grahamstown Drain. The study area was located on the sandy fill of the Newcastle Bight embayment, which consists of Holocene and Pleistocene aeolian beach ridges, transgressive sand sheets and low dunes with intervening swamps. The major water sources surrounding the study area were the Hunter River located approximately two kilometres west and the former Grahamstown Swamp (now an artificial lake) located about three kilometres east. Additionally, the Grahamstown Creek flowed from the swamp and was located approximately 30 metres south of the southern end of the study area, and other swamps occur throughout the wider surrounds. A search of the AHIMS register identified 16 known Aboriginal sites recorded within five kilometres of the study area and included six open camps, two burials, one quarry, one shell midden, one scarred tree, two artefact and three PADs. Previous assessments identified that occupation focussed on the dune areas overlooking the interbarrier depression. Proximity to water was clearly an important factor, with sites running along the length of dunes, at times in clusters on consecutive dunes (although this may be due to sampling and the area surveyed). Sites reduce in number significantly away from the interbarrier depression between the Holocene dunes towards the coast, and increase again along the coast. The lack of sites from Anna Bay to Nelson Bay, during previous studies, may be due to any number of reasons including survey sampling, vegetation cover, and distance from water or other cultural and environmental constraints. One new site was identified (MHR1) and was an isolated artefact. This silcrete proximal broken flake was located along a track in SU2 along the eastern boundary. The site and surrounding area was examined for more artefacts but no additional artefacts were found. Found in a disturbed context there was little to no potential for subsurface cultural materials. MCH found that the northern portion study area, including the terrace overlooking the creek and flood plain area, would have been suitable for sustainable occupation due to the availability of water and associated resources. It was known from previous excavations that site RT1 was present up to the western boundary of this study area and it was expected that this subsurface site extended into the present study area. Therefore, this section was identified as a PAD. MCH recommended a s90 collection for the isolated artefact and a s87 for test excavation of the PAD.

**MCH 2010a. Mount Hall Road, Raymond Terrace. Indigenous Archaeological test excavation: s87 test excavation (AHIP# 1112240 – 3240) s90 collection (AHIP# 1112289 – 3241). Report to 87 Mount Hall Road Raymond Terrace Unit Trust**

MCH (2010a) undertook a s87 archaeological test excavation of an identified PAD (AHIMS #38-4-1240) under AHIP #1112240 – 3240, and the collection of site #38-4-1158, an isolated artefact under AHIP #1112289-3241 at 87 Mount Hall Road, Raymond Terrace. A total of 20 1m x 1m test pits were excavated and all pits were subject to heavy root disturbance in the upper levels that decreased with depth. The upper levels were characterised by rootlets and roots less than one centimetre in diameter with some up to two centimetres in diameter. The largest roots, most approximately five centimetres in diameter, were found primarily at a depth of between 25 and 45 centimetres below surface. Insect disturbance was noted in all pits though to varying degrees. Insects observed include worms, witchetty grubs, spiders and beetles. A charcoal lens is present across the PAD at 10 to 15 centimetres below the surface indicating a bush fire. Six pits contained artefacts with a total of 61 artefacts recovered and manufactured from tuff, silcrete and mudstone. Artefact types included flakes, broken flakes, flake pieces and backed artefacts. MCH recommended that a s90 AHIP is required for Site 38-4-1240 (pit 20) if it will be impacted.

**MCH 2010b. Mount Hall Road, Raymond Terrace. Indigenous Archaeological s90 salvage (AHIP# 1114100). Report to 87 Mount Hall Road Raymond Terrace Unit Trust**

MCH (2010b) undertook a s90 salvage of site #38-4-1240 under AHIP #1114100 at 87 Mount Hall Road, Raymond Terrace. The excavation of Pit 20 included an additional eight 1m x 1m squares around the original Pit 20. In addition to this, as artefact densities increased in squares 2 to 5, an additional three 1m x .5m half squares (labelled squares 3 ext, 4 ext, 5 ext) were excavated to the east and adjoining squares 3 to 5. The artefacts from Pit 20 excavated previously were included in the artefact analysis as they formed part of the overall site. A total of 281 artefacts and three small pieces of ochre were recovered, all manufactured from tuff, silcrete and mudstone. Artefact types included flakes, broken flakes, flake pieces and backed artefacts.

**RPS. 2010a. Aboriginal Archaeological Excavation Works Stage 2 AHIP #3 157-1 I 01504 Williamtown Aerospace Park. Report prepared for Williamtown Aerospace Park.**

RPS (2010) completed an archaeological test excavation and surface collection of Stage 2 sites covered in the Aboriginal Heritage Impact Permit #3157-1101504. The investigation area was located about 15 kilometres to the north-east of Newcastle, on the western side of Nelson Bay Road in Williamtown within Lot 11 DP 1036501. Past impacts in the investigation area included sand mining. Landforms across the investigation area consisted of dunes and foreshore area, being predominantly situated both on the Inter-Barrier Depression and on a portion of remnant sand dune which formed part of the Newcastle Bight sand barrier system. The investigation area was situated on the Tomago Sandbeds, which derived from Holocene and Pleistocene Aeolian and marine sand deposits. The deposits had been extensively reworked to form dune systems and sand sheets of Quaternary sediments, including Aeolian and marine sand deposits as well as silt and clay deposits. A small vegetated sand dune was situated in the area and flora species were recorded from nine vegetation communities, being: Coastal Sand Apple-Blackbutt Forest, Coastal Sand Wallum, Coastal Wet Sand Cyperoid Heath, Coastal Wet Sand Cyperoid Heath regrowth, Freshwater Wetland Complex, Scrub - *Leptospermum juniperinum*, Scrub - *Melaleuca ericifolia*, Swamp Mahogany - Paperbark Forest and Swamp Oak - Rushland Forest. Drainage depressions and heath swamp areas were the main water sources for the area, with the swamplands having supported rich resources. The Research Design and Methodology for the archaeological excavation of the investigation area was developed based on the previous work in the area and discussions with the Aboriginal community. Proposed research

questions included discovering if the site extended into the Pleistocene level of the dune, if use wear analysis could indicate resource exploitation and if there were differences in tool reduction processes and raw material uses.

Nine geoarchaeological test pits were excavated as part of the archaeological investigation. Two archaeological test trenches were excavated for the salvage of Aboriginal artefacts and the recording of any relevant features. Test Trench 1 (TT1) excavated six cubic metres of sand/soil material and Test Trench 2 (TT2) excavated two cubic metres of the same. Cultural material was only recovered from TT1, which also contained two Aboriginal hearths, one with charcoal. Radiocarbon dating of the charcoal gave the result of conventional age or percent modern carbon. Surface collection was undertaken at AHIMS sites #38-4-0301 and #38-4-1146. A total of 1695 artefacts were identified through test excavation. This included 1023 angular fragments, 569 flakes, 30 pieces of ochre, 27 tools, 24 manuports and 22 cores. Raw materials used in artefact manufacture included tuff (being the most common), silcrete, Mafic volcanic, quartz, Felsic volcanic, sedimentary and quartzite.
The site did not extend into the Pleistocene dune level. The majority of tools were backed artefacts which did not exhibit signs of use. A total of 89 percent of complete flakes were tuff and 87 percent of backed artefacts were made from tuff. This pattern was assessed as likely due to the higher availability of tuff as an abundant primary source of tuff was available within 13 kilometres of the site. It was concluded that Aboriginal people were utilising the location during the late Holocene period. The high density of artefacts, compact shell deposits and the presence of two hearths indicated intensive use over a period of time. However, the small amounts of food resource material (shell and bone) recovered indicated that the site was not inhabited for an extended period. It was concluded as unlikely that large numbers of Aboriginal people had used the site. It was stated that no further archaeological work was required in the investigation area. All land within the investigation area had been subject to previous archaeological surveys, a surface collection programme of AHIMS sites #38-4-0301 and #38-4-1146 and archaeological test excavation.

RPS recommended that an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the National Parks and Wildlife Act (1974, as amended) should be sought in order to allow future proposed works to go ahead. All relevant staff and contractors should be made aware of their statutory obligations for heritage and if Aboriginal site/s are identified, the site Project Manager is to contact RPS and the relevant Aboriginal stakeholders so they can adequately assess and manage the site. Finally, that in the unlikely event that skeletal remains are identified, work must cease immediately and appropriate assessment be undertaken.

**RPS. 2010b. Construction Aboriginal Cultural Heritage Management Plan Lot 32 DP 1014864 Masonite Road Heatherbrae. Report prepared for Sandvik Mining and Construction Australia Pty Ltd.**

RPS (2010) produced a management plan to cover heritage within the bounds of Lot 32 DP 1014864 Masonite Road Heatherbrae. This project area had been approved for the development of the headquarters of Sandvik Australia. The topography of the study area consisted of low lying flats with broad sandy rises. Some Aeolian deflation basins were also noted in the area. Vegetation communities represented in the study area included smooth-barked apple, blackbutt open forest and blackbutt moist forest, containing a diverse range of resources for past Aboriginal people. The study area was well-resourced in terms of water availability, with the Hunter River, Windeyers Creek, Siddons Swamp and Blind Harrys Swamp all located in close proximity. A search of the AHIMS register identified 35 sites surrounding the study area. These consisted of 23 artefact scatters, five PADs, four isolated artefacts, two modified trees and one midden. It was predicted that a sand ridge across the southern portion of the study area had the potential to contain cultural deposits. It was predicted that artefact scatters and isolated artefacts were the site types most likely to occur. It was

further predicted that modified trees could occur within remnant vegetated areas. The management plan stated that the RAPs should undertake monitoring during ground disturbance works in the study area. Stop work procedures were included to be followed if Aboriginal cultural material was discovered during monitoring. Site recording and site management procedures were also outlined in this document.

**MCH 2011. Salt Ash sand quarry test excavation. Indigenous archaeological test excavation. Report to ATB Morton Group of Companies**

MCH (20110 undertook an archaeological test excavation of two PADs previously identified within the Salt Ash Sand Quarry project area under Part 3A. The study area was located approximately 20 kilometres north east of Newcastle along Nelson Bay Road, Salt Ash and comprises of Lot 4042 DP 1090633, Lot 632 DP609506 and Lot 633 DP 609506. The study area was situated within a complex geomorphological system (Newcastle Bight sand barrier dune system) including the inter barrier depression and Holocene stabilised sand dunes. Two PADs had been identified during the initial assessment and PAD one was located on the Holocene stabilised Holocene transgressive dune (crest) and PAD 2 was located on the stabilised Holocene sand dune (swale). The excavation methodology was developed previously by RPS in consultation with the Aboriginal community and aimed to provide a sample of the study area in accordance with the research questions. The test excavation concentrated on areas of high and moderate archaeological sensitivity. The target area extent for the archaeological testing was 6m$^2$ in PAD 1 and 6m$^2$ in PAD2. A total of 7 test pits were excavated in PAD1 and all pits were subject to heavy root disturbance in the upper levels that decreased with depth. The upper levels were characterised by rootlets and roots less than one centimetre in diameter with some up to two centimetres in diameter. Insect disturbance was noted in all pits to varying degrees. Insects observed include worms, witchetty grubs, spiders, ants and beetles. Charcoal was found throughout the upper layers indicating a bush fire. Due to the dense vegetation in PAD2 and access issues, only one test pit was excavated in this PAD. This PAD was heavily vegetated with both mature and immature trees, bracken fern and some lantana cover. Decaying organic material was found distributed throughout the pit, with the highest density of material in the upper levels indicating that fires have passed through the area. The pit had heavy root disturbance in the upper levels that decreased with depth with the upper levels characterised by rootlets and roots less than one centimetre in diameter with some up to two centimetres in diameter. Insect disturbance was noted including worms, witchetty grubs, spiders, ants and beetles. No cultural materials were identified.

**Umwelt. 2011a. Research Design and Methodology to accompany an Aboriginal Heritage Impact Permit Application for Sub-Surface Investigations, Tomago, NSW. Report prepared for EnergyAustralia.**

Umwelt (2011) completed an AHIP application in relation the proposed 33 kV overhead sub-transmission line (feeder) stretching between Tomago and Williamtown. Past impacts in the study area included vegetation clearance, excavation and fill deposition. The topography of the study area consisted of the large Stockton Bight dual barrier formation, comprising a Holocene age seaward barrier and low swampy depressions. The underlying geology consisted of Tomago Coal Measures which included tuff. A known high-quality tuff outcrop utilised for tool manufacture was 12 kilometres away at Nobbys Head, while another known tuff quarry site was at Shortland, situated 11 kilometres away. The beach area containing the three sites and area of PAD was largely devoid of vegetation, but the immediately surrounding area contained multiple floral resources. Some vegetation types included mat-rush, banksia, sword sedge, bungwahl, bracken fern, water ribbons and tea-tree, as well as eucalypts and native grasses. The available resources of the past are likely to have provided use for food, material and medicinal purposes. Water sources in the surrounding area

included Grahamstown Swamp and the Hunter River. A search of the AHIMS register identified 19 sites in the surrounding area. A previous assessment by Umwelt identified that the majority of the proposed alignment had low potential to impact Aboriginal cultural heritage values, objects or deposits and was therefore not recommended for any constraints. The western end of the alignment, however, contained one area of Potential Archaeological Deposit (PAD) as well as three previously registered AHIMS sites, being A1 (#38-4-0647), A2 (#38-4-0648) and A3 (#38-4-0676). As there was a high likelihood that the proposed works would impact on these sites an AHIP application was recommended. As the major ground impacts associated with the proposed works consisted of excavation at each of the power pole locations, a pedestrian survey to inspect each of the proposed locations along the route was undertaken during August 2010. No new sites or surface material pertaining to the previously registered sites was identified and RPS noted that ground vegetation cover lowered the surface visibility at this time. A test excavation program was recommended to determine the subsurface content at each of the proposed pole locations. It was proposed that a two metre by two metre area be excavated at each of the proposed pole locations and that surface collection be undertaken for any objects identified during the testing works. Management procedures were cited by the discovery of hearths and skeletal material and it was recommended that all workers and contractors for the pole construction be made aware of the legislative requirements for protecting cultural heritage during works. The proposed research design included such questions as what resources were available in the past, how they were transported, how landscape use varied by place, time and activity, and what differences there were between Holocene assemblages and Pleistocene assemblages. It was proposed that any salvaged artefacts be reburied at an appropriate and safe location, following stone tool analysis.

**Umwelt Australia Pty Ltd. 2011b. Aboriginal Cultural Heritage Assessment Report – Archaeological investigations undertaken under AHIP#3271, Medowie Road, Williamtown. Report prepared for Ausgrid.**

Umwelt (2011) undertook a surface artefact collection and archaeological test excavation under the conditions of AHIP #3271. The study area was located on Medowie Road in Williamtown, where Ausgrid proposed to establish an underground 11 kV feeder on the eastern side of the Medowie Road reserve, located between the suburbs of Medowie and Williamtown. The linear area of impact was approximately 3.5 kilometres in length. All proposed project impacts were to be confined to a 20-metre corridor, inclusive of vehicle access and construction works. The collection and test excavation works followed previous surveys undertaken by Umwelt within this study area. The objective of this report was to provide the results of the surface collection and test excavation activity, as well as to provide additional information relating to the AHIP application for the study area. The study area was located within a transgressive dune field of Pleistocene age that formed part of the Inner Barrier of Stockton Bight. It bordered the low-lying area known as the Inter-Barrier Depression, consisting predominantly of low relief dunes and swales. A network of large freshwater swamps was located in the vicinity of the study area, along with such water sources as Galloping Swamp, Moffats Swamp and Campvale Swamp. The construction of Medowie Road had removed mature vegetation from the study area. A search of the AHIMS register identified 106 previously recorded sites within a search area measuring 10 kilometres by 14 kilometres, centred on and containing the study area. These comprised 54 middens, 48 artefact sites (combining artefact scatters and isolated artefacts), two Aboriginal resource sites, one burial and one PAD. During the previous survey works Umwelt identified an additional archaeological site within the study area (#38-4-1206). They also classified five areas of low-relief dune crest and associated slopes as PAD. This was a precautionary measure due to low visibility at the time of inspection. Four surface artefacts were collected from site #32-4-1206 during works under AHIP #3271. No surface artefacts were identified for collection from #32-4-0256. Test excavations were conducted in four areas with 370 artefacts collected; 360 out of the total 370 were recovered from the A2 horizon at locations where this soil horizon appeared to be

relatively intact. It was noted however that the upper units of the soil profile in Area 1 appeared to have been significantly disturbed. Artefact types identified during these works included flake, broken flake, retouched flake, geometric microlith, core, flake as core and heat shatter. The most common type was broken flake (n=234) followed by flake (n=93). The assemblage was dominated by artefacts made from the raw material silcrete. Since Nobbys tuff was generally the most common raw material in assemblages from Stockton Bight, the high representation of silcrete was interpreted as having derived from two knapping events. The results of the test excavation identified new sites and further characterised the subsurface context of others. The results of this are summarised below in Table 19.

Table 19. Summary of sites (Umwelt 2011)

| Site | Site type | Landform | Distance to water | Stream order | Artefacts /features | Disturbance | Subsurface potential |
|---|---|---|---|---|---|---|---|
| 38-4-1206 | artefact scatter | dune | not provided | swamp | 316 | road corridor | yes |
| EA Williamtown 2 | artefact scatter | dune | not provided | swamp | 40 | road corridor | yes |
| 38-4-0256 | artefact scatter | dune | not provided | swamp | 12 | road corridor | yes |
| EA Williamtown 3 | artefact scatter | dune | not provided | swamp | 2 | road corridor | yes |

Umwelt recommended that Ausgrid should ensure that its employees and contractors be made aware that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an Aboriginal Heritage Impact Permit (AHIP). Ausgrid should apply to extend the existing AHIP permit to cover the proposed impacts to sites but no further archaeological investigation was recommended. Additionally, that should human skeletal material be identified all works should cease immediately and the appropriate authorities be contacted. Finally, that additional consultation should be undertaken with the relevant Aboriginal parties to identify an appropriate location for the reburial of artefacts recovered under AHIP #3271, with this reburial to be conducted within the timeframe of the new AHIP.

**Insite Heritage Pty Ltd. 2011. Archaeological Assessment for the Proposed Conductor and Rod Facility by Midal Cables International Pty Ltd at Tomago NSW. Report prepared for GHD Pty Ltd.**

Insite Heritage (2011) completed an archaeological assessment of a proposed aluminium rod and conductor facility. The study area (comprising Lots 5 and 6 DP 270328) was approximately 2.8 hectares in size and located in the suburb of Tomago. The proposed works included construction of a 150 metre long access road to connect the proposed facility with the existing Tomago Aluminium facility, the construction of various buildings and laboratories, cooling towers, a car park and utilities upgrades. The study area had been subject to past disturbance, including sand mining and industrial development. The topography of the study area included dunes, ridges and plains. These included Pleistocene beach ridges and sand sheets on the Tomago Coastal Plain, bordered by the interbarrier depression of Tilligerry Creek to the south. The deposits of these beach ridges and sand sheets comprised marine and Aeolian quartz sands. The study area had previously been identified as comprised of Holocene flood plain alluvium. Tilligerry Creek was the main water source for the area, with the Hunter River located to the west and south and Fullerton Cove (with associated wetlands)

located to the east. The vegetation of the study area was predominantly regrowth wet heath forest, dominated by *Banksia oblongifolia*, *Melaleuca nodosa*, *Melaleuca linarifolia*, *Xanthorrhoea fulva*, *Callistemon citrinus*, *Hakea teretifolia* and *Persoonia spp*. (geebung). A search of the AHIMS register identified nine sites within 20 square kilometres of the study area and included one scarred tree, seven open camp sites (artefact scatters and isolated artefacts) and one PAD. It was predicted that the study area could contain smaller artefact scatter sites associated with transient occupation of the plains area. It was predicted that such low density sites could be located back from the inter barrier depression and the Hunter River. It was assessed that major occupation sites were more likely to be located in closer proximity to the wetlands associated with Fullerton Cove to the east and with the Hunter River to the south, due to increased resources at these locations. The survey focussed on areas of exposure and identified that the majority of the study area was covered in fill deposited during the past industrial activity. The fill was gravel situated over approximately 4.5 metres of Quaternary sand deposits. No sites were identified and Insite concluded that there were no archaeological or cultural constraints to the development as proposed. It was recommended that monitoring be undertaken by Aboriginal representatives during the initial installation of services, with stop work procedures to be followed should any unexpected sites be identified.

**Biosis Research. 2011. Underground 11kV Distribution Cable, Campvale, Medowie, NSW: Aboriginal Cultural Heritage Report. Report prepared for Ausgrid.**

Biosis Research (2011) completed an archaeological assessment of an area proposed for development as an underground 11kV distribution cable, crossing through the areas of Campvale and Medowie in NSW. The study area was located within the Newcastle Bight area of NSW and noted as containing Pleistocene transgressive dunes, being within a foreshore area. Moffats Swamp was noted as a water source in the surrounding region with estuarine resources noted as having been utilised by past Aboriginal people in the wider area. A search of the AHIMS register identified two previously recorded artefact scatters occurring within the bounds of the study area. No sites or PADs were identified during the survey and the two previously recorded sites were confirmed as being located within the bounds of the study area (AHIMS #38-3-0037 and #38-3-0038). Past impacts in the area of these sites were noted as including an existing electricity easement, vegetation removal and wind-blown erosion. It was recommended that the proposed cable design and position be realigned to avoid impacts to AHIMS #38-3-0037 and to minimise impacts to #38-3-0038. It was recommended that an AHIP be sought to cover the partial impacts to #38-3-0038. No further archaeological work was recommended prior to the proposed works proceeding.

**Mitchell. M. 2012. T4 Project Heritage Assessment. Report prepared for Port Waratah Coal Services Ltd**

Mitchell (2012) undertook an archaeological assessment of the T4 Project, being a proposed coal export terminal at Carrington and Kooragang Island in the port of Newcastle, NSW. The proposed works included the construction of new rail tracks, train unloading facilities, a coal stockyard, conveyors, wharves, berths, ship loaders and other ancillary facilities. The topography of the study area was predominantly composed of flat reclaimed land, used in the past for the disposal of industrial waste and dredged material. It was located on the edge of Newcastle Harbour in the port of Newcastle, in the central coast region of NSW. The Hunter Wetlands National Park and the Hunter Estuary Wetlands Ramsar site were both located in close proximity to the study area, containing such vegetation as mangroves, wetlands and saltmarsh, as well as forested and pastured lands. The majority of the study area was disturbed grassland on modified (reclaimed) land. A search of the NPWS register identified three sites in proximity to the study area (two middens and an artefact scatter). The search result coordinates initially suggested these may have occurred within the study area, but further investigation identified this was as a result of erroneous coordinates and that there

were in fact no previously recorded sites within the bounds of the study area. No historic heritage items or shipwrecks were listed on any relevant registers within the study area. No predictive model was produced for this report. No sites were identified during the survey and it was concluded that no further archaeological assessment was required. The proposed works were recommended to proceed without heritage constraint. Stop work procedures were recommended should unexpected finds occur during the proposed works.

**Umwelt Australia Pty Ltd. 2012. Report on salvage works conducted under AHIP #3382, Tomago, NSW. Report prepared for Ausgrid.**

Umwelt (2012) undertook a surface collection and salvage excavations at specific locations within a previously recorded site and PAD within the Tomago to Williamtown power line project area. These works were to be undertaken in proposed areas of impact for a new 33 kilovolt (kV) feeder extending from Tomago to Williamtown, north of Newcastle, NSW. These works were undertaken under the conditions of Aboriginal Heritage Impact Permit (AHIP) #3382. The topography of the study area consisted of a slopes within a large dual barrier formation known as Stockton Bight. Stockton Bight was composed of an inner barrier of Pleistocene age (referred to as the Inner Barrier), a seaward barrier of Holocene age (referred to as the Outer Barrier) and a low-lying swampy depression that divided the barriers and was known as the Inter-Barrier depression. In the Aboriginal past the closest water source would have been a large estuarine swamp containing pockets of freshwater swamps, with other swampy areas surrounding. The beach ridge and dune formation would have also hosted a variety of vegetation, which had since been cleared. A past assessment had three identified sites A1 (#38-4-0647), A2 (#38-4-0648) and A10 (#38-4-0676) and an area of Potential Archaeological Deposit (PAD1 - #38-4-0679) in the study area. This report detailed the results of salvage works at these locations. No surface artefacts were located in the study areas so surface collection was not undertaken. Excavations were conducted at proposed pole locations, each marked out as a two metre by two metre square, divided into four one by one metre squares, and further subdivided into four quadrants of 50 centimetres by 50 centimetres. All excavated material was passed through a three-millimetre gauge sieve. The salvaged assemblage consisted of only 10 artefacts. All artefacts were manufactured from Nobbys tuff and were predominantly broken flakes, with four complete flakes and one flaked piece. Of the complete flakes, the largest flake exhibited signs of use on its distal margin. The artefacts were all relatively small and did not include any formal tool types such as geometric microliths. Umwelt recommended the artefacts be reburied following the completion of the proposed works, in accordance with Requirement 26 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.

**ERM. 2012. Northern Dune Heritage Assessment. Report prepared for Unimin Australia.**

ERM (2012) was commissioned to undertake a heritage assessment of the Northern Dune area at Oyster Cove, Port Stephens, NSW. It was proposed to extend an existing silica sand extraction operation and the study area was assessed for potential heritage impacts from this activity. Landforms within the study area consisted of dunes on the inner Pleistocene sand barrier. There were no creeks or rivers in or near the study area, but within low lying parts of the dune system the water table was close to the ground surface. The vegetation was coastal sand apple-blackbutt forest dominated by smooth-barked apple and blackbutt with occasional red bloodwood. A search of the AHIMS register identified eleven previously recorded sites including three middens and eight artefact sites. The closest of these was 80 metres from the study area, with no previously registered sites identified within the bounds of the study area itself. These results indicated that artefact scatters constituted the predominant site type in the wider region, found in any location, on any landform, closely spread towards the margins of swamps and near the confluences of water courses. It was predicted that the most likely site type to occur within the study area itself was midden, with artefact sites and burials also identified as possible, but less likely. No sites were identified during the survey,

but it was noted that the study area was located within a sensitive landscape. The reason given for the lack of identified sites during the survey was low ground surface visibility at the time of inspection. It was recommended that since ground surface visibility was limited during the survey that further monitoring was required. It was recommended that clearing be monitored prior to sand extraction activities being undertaken. It was stated that the clearing of the vegetation would allow ground surface visibility for the Aboriginal community groups present during initial fieldwork to walk over the cleared areas to determine if any Aboriginal archaeological sites were present.

**MCH 2012a. Northbank Enterprise Hub, Tomago. Aboriginal Heritage Impact Assessment. Report to Northbank Enterprise Hub Pty Ltd.**

MCH 2012a) completed a Due Diligence Archaeological Assessment for the proposed industrial subdivision of Lot 1001 DP 1127780 along Tomago Road, at Tomago. The proposed development was for an industrial subdivision and associated filling and earthworks, roads and services and is known as the Northbank Enterprise Hub. The study area, located approximately 6 kilometres south of Raymond Terrace and 8 kilometres west of Williamtown along the Tomago Road, Tomago includes Lot 1001 DP 1127780 and comprises approximately 239 hectares of land. The study area is located within the Coastal Zone of the Hunter Valley, which is mapped as being within the Hunter Land System of alluvial terraces. The Coastal Zone also contains Pleistocene and Holocene stabilised and transgressive dunes consisting of steep and low dunes with extensive swamps and depressions and in between both dunal systems is the interbarrier depression. The study area is situated on the interbarrier depression with its northern boundary along a low dune at the interface of the interbarrier depression and the Inner Pleistocene dunes, also known as the interbarrier depression. The majority of the study area was considered well-resourced in terms of water availability and associated resources, it is situated on the flood plain within swamps/wetland areas (interbarrier depression) which would not have been suitable for occupation. The far north western portion of the study area consisted of a low dune overlooking the interbarrier depression and hence was considered suitable for occupation.

Seventy known sites were identified by AHIMS within a 8km radius of the study area with the most predominant being shell middens followed by artefacts, scarred trees, earth mounds, resource and gathering, ceremonial and burials. All of these sites are located along both the Holocene and Pleistocene dunes that overlook the interbarrier depression. Traditionally, the ocean was an important source of food resources for the Worimi people. Additionally, the interbarrier depression was an important area for hunting, gathering and/or foraging as indicated by the prevalence of sites on the Holocene and Pleistocene dunes overlooking the depression. It was therefore predicted that there is a moderate potential for in situ archaeological sites within the dune in the north of the investigation area and a low potential in the remainder which is the interbarrier depression.

The survey revealed that vegetation was very dense with visibility being only .52%. The survey focused on areas of exposure, which were minimal, and included tracks and exposed areas. Two shell middens and one associated PAD were identified in the north on the dune overlooking the interbarrier depression. The surface sites were exposed through disturbances including demolition of structures, tracks and erosion, are scattered and have no subsurface associations due to the levels of disturbances. The location of the sites and PAD as well as the visible site contents is consistent with the archaeology of both the local and regional areas. Four previously identified sites (NB1, NB2, NB3, NB4) by Indigenous Outcomes (2010) had GPS coordinates that places them within the study area but were not registered on AHIMS. Upon further investigation including re-locating the sites with a surveyor and slashing the surrounding area to increase visibility, it was revealed that

coordinates are situated within the interbarrier depression and no cultural materials were evident. This landform was considered highly unsuitable for occupation as it is part of the interbarrier depression. These un-registered sites are not archaeological or cultural sites and discussions between the archaeologist and Aboriginal representatives on site confirmed this. MCH recommended that of the sites will be impacted on an AHIP will be required and if the PAD will be impact on further investigations (test excavations) will be required.

**MCH 2012b. Heatherbrae industrial rezoning. Indigenous Archaeological Due Diligence Assessment. Report to ADW Johnson.**

MCH (2012b) an Indigenous Archaeological Due Diligence Assessment for the proposed rezoning of approximately 80 hectares of land to industrial for future industrial development at Heatherbrae. The study area was located along Masonite Road the study area includes Part Lot 1202 DP1174968. Geomorphologically, the southern portion of the specific study area is situated on the Inner Pleistocene barrier and sand dunes and the remainder on the Holocene flood plain. The specific study area has been subject to significant land uses including 99% of the study area was planted out in 1970 with slash pine plantation and the entire site was cleared and ploughed with trees being planted on the ridge of the plough lines. Associated land uses with the plantation include the construction of tracks and power easements. Prior to European land uses, there would have been a high potential for sites on the inner Pleistocene dune. Sites would have been predominantly middens (composed of either or both estuarine and marine shell species) and open camps, with a sparse scattering of cultural material along the ridgelines of the dunes and high-density sites situated on low flat ridgelines immediately adjacent to wetlands. However, the pine plantation would have significantly altered this landform and it is expected that no sites would have survived within the study area. The flood plain area would have been regularity flooded/waterlogged and as such considered well-resourced for occupation of the dunes (not the flood plain itself). The survey showed that overall effective coverage was 14.24% with trees and associated leaf litter being the limiting factor. The disturbances included clearing, pine plantation, fences, power easements, tracks and erosion, all of which have impacted upon the landscape and associated cultural materials. No sites or PADs were identified.

**MCH 2012c. Glasshouse, Williamtown. Aboriginal Heritage Impact Assessment. Report to ADW Johnson.**

MCH (2012c) undertook an Indigenous Archaeological Assessment for the proposed 32HA Glasshouse Development located at 157 & 183 Cabbage Tree Road, Williamtown Lot 1331 DP 609173 & Lot 1332 DP 609173. The proposed development was a 16.4ha glasshouse facility for vegetable growing, storage and distribution and includes associated buildings incorporating ancillary facilities such as offices, storage and test growing rooms, irrigation and boiler equipment, canteen facilities, employee amenities, car parking areas and access roads, landscaped / green areas, storage basins for roof rainwater, removal and replacement of an existing regional open drain on site, and construction of a compacted earth bund (approximately 3m high above natural ground level) around the perimeter of the development footprint. No excavation or fill was proposed, the buildings were proposed to be constructed at ground level. The study area was situated within the inter-barrier depression and is located on the flood plains of the Hunter River and includes swamps/ wetlands with a manmade dam roughly through the centre (east west) and two man made drains one along the western boundary and the other along the southern boundary. This landform context of the study area was not considered to be suitable for occupation, rather the surrounding elevated dunes overlooking the inner barrier depression would be considered more suitable. Vegetation was very dense at 1% and exposures were minimal. No sites or PADs were identified which fit the predictive model. No culturally significant sites were identified by the Aboriginal stakeholder representatives

on site or during the consultation process as past occupation was focused on the elevated Holocene and Pleistocene dunes overlooking the interbarrier depression.

**MCH. 2015a. Campvale to Salt Ash. Archaeological Due Diligence Assessment. Report to Telstra.**

MCH (2015a) undertook an assessment for the proposed 2.5kms of new cable ploughing/trenching works from Telstra Fibre Access Point (FAP) located within Lot1/DP396829, 1405 Richardson Road, Campvale, NSW to a second FAP located within Lot1/DP856211 90 Boundary Road, Salt Ash, NSW. The study area was situated in Coastal Zone on Inner Pleistocene sand dunes and included low lying sand dunes adjoining swamps and wetlands with ephemeral drainage lines. The study area had been repeatedly cleared, trenched and disturbed for the purpose of unsealed access roads and Hunter Water, Telstra and Department of Defence infrastructure purposes. The survey area commences at a Telstra Transmission Tower and ends in a Department of Defence target range. Power poles, underground cabling, water diversion and drainage works were noted with wholesale clearance of native vegetation has occurred and only remnant low level vegetation remains. The regional environment provided resources, including raw materials, fauna, flora and water, that would have allowed for sustainable occupation of the area. However, within the study area, little of the original landforms remain due to the clearance and grading of surfaces for access tracks. The crests of the dunes may have been suitable for travel during the wet season and little more due to the distance from reliable water and associated resources. The landuses and impacts from land uses across the study have had high impacts upon the archaeological record. No sites or PADs were identified

**MCH. 2015b. Proposed sand quarry - Cabbage Tree Road, Williamtown. Aboriginal Heritage Impact Assessment. Report to Benellie Equity Pty Ltd.**

MCH (2015b) completed an Aboriginal Heritage Impact Assessment for the proposed rezoning for sand extraction at Williamtown, NSW. The proposed quarry was situated over multiple lots including Lot 1 DP 224587, Lot 121 DP 556403, Lot 11 DP 629503 and Lot 1012 DP 814078. The project area is located along Cabbage Tree Road, Williamtown and comprises approximately 176 hectares, of which approximately 69.85 hectares will be utilised for quarrying operations. This area was further divided into 3 Primary Extraction Areas including Area 1 (7.93ha), Area 2 (44.59ha) and Area 3 (17.33ha). The proposed quarry will involve site preparation including the establishment of extraction boundaries, vegetation clearing, removal and stockpiling of topsoils, bulldozing and/or hydraulically excavating sand for processing. The establishment of the quarry will include construction of intersection, site access road, establishment and construction of site office/facilities/ weighbridge, extraction of sand from within the extraction areas, sand processing, stockpiling, haulage of production from site and site rehabilitation. The project area included approximately 700m of Cabbage Tree Rd northern road reserve and the inner barrier sand dunes, approximately 100m from the edge of the inter barrier depression. Local landforms across the project area include two dune crests, slopes and swales. This landform context is considered to be suitable for past short-term occupation and/or hunting and gathering. As resources would have been available from the inter barrier depression approximately 100 metres to the south, larger, long term occupation is expected to have been closer to the resources and decline in density over 50 metres from that resource. One previously identified site (38-4-1381) was re-located within the project area and was located on the mid slope of a dune within an exposed area. Situated approximately 300m from an unnamed swamp. Originally containing 66 artefacts including 42 flake pieces, 16 flakes, four cores, one grinding stone and one ochre nodule (manufactured from tuff, chert and silcrete and the grinding stone from metamorphic material), the site showed motorbike tracks across it. The site was assessed as having poor integrity, low research potential and low scientific significance. The project area had been subject to past landuses including clearing for past pastoral activities, revegetated, with minor sand extraction activities in the south west, several tracks, cleared and exposed areas and

nonoperational groundwater bore holes are present. No additional sites were identified. Due to the impacts of past and present land uses, no PADs were identified and MCH recommended that site 38-4-1381 will require community collection.

**MCH. 2017. 145 Lot Industrial Estate, Heatherbrae. Aboriginal Heritage Impact Assessment. Report to CABP Group Pty Ltd.**
**MCH. 2018. 145 Lot Industrial Estate, Heatherbrae. Archaeological Salvage. Aboriginal Heritage Impact Assessment (AHIP # 1132063). Report to CABP Group Pty Ltd.**
**MCH. 2019. 145 Lot Industrial Estate, Heatherbrae: Additional area. Aboriginal Heritage Impact Assessment. Report to CABP Group Pty Ltd.**
**MCH. 2020. 145 Lot Industrial Estate, Heatherbrae. Archaeological Salvage. Aboriginal Heritage Impact Assessment (AHIP # C0005569 AHIMS Permit ID 4566). Report to CABP Group Pty Ltd.**

MCH completed an Aboriginal Cultural Heritage Assessment, test excavation and salvage excavation for the approved 145 Lot Industrial Estates development at Heatherbrae (DA 2006-636 and DA 2014-422). The project is located off Masonite Road and Camfield Drive, Heatherbrae. Including Lot 1202 DP 1174968 and Lot 23 DP 1234094, it is noted that DA 2006-636 refers to some old lot and DP numbers which have now been superseded. The proposal is for the land subdivision of the subject parcels creating approximately 140 industrial lots ranging in size from approximately 2000m2 up to 2 ha. The study area is situated on the inner Pleistocene barrier and sand dunes, more specifically the project area includes an elevated dune in the south west and northern section of the project area that are surrounded by very low-lying swamps/ wetlands. Another elevated dune is located along the eastern boundary with its tail end just inside the project area. The northern point and eastern boundary of the project area are situated approximately 200 metres west of Windayers Creek (2nd order) and The Hunter Rive is located approximately 2 kilometres to the west. The majority of the project area is very low lying and swampy and it is likely that those low-lying areas would have been waterlogged during times of heavy rain. The exception to this includes the elevated dunes within the project area which may have provided suitable elevated landforms for short term/low density past Aboriginal land uses. Based on landforms and proximity to water, the project area was considered not well resourced in terms of water availability and long term/large group camping suitability. However, the low-lying waterlogged environments were favoured for hunting and gathering and/or travel to The Hunter River and with elevated dunes in that environmental context may also have provided for short term/low density camping during times of heavy rain.
The survival of cultural materials is dependent on past and present land uses and associated impacts. The project area has been subject to a number of past land uses and associated impacts. Prior to 1938 the entire project area had been used for farming land and since 1938 has been logged, cleared and replanted numerous times. Utilised as a woodlot plantation resource for timber processing activities, processed effluent was being applied to the site via travelling irrigators and spray irrigation. A former sand mine/quarry that has been filled with old machinery and other waste products is located to the south of the project area on both sides of Masonite Road, a dam has been constructed to the east of the former sand mine, tracks, fencing, and stockpiling throughout has occurred. Presently, the western portion (west of Masonite Road) contains numerous stockpiles of trees and grasses, the north-eastern portion included open pasture lands and the mid-section contains open pine forest with numerous tracks. Power easements are located along the far western border and north-east portion. Such land uses and impacts have significantly impacted on the top 30-40cm (at least) and have thus impacted and disturbed any cultural materials present on the surface and at such a depth.
A search of the OEH AHIMS register has shown that 53 known Aboriginal sites are currently recorded within five kilometres of the project area (Table 5.1). Of these one SHL/AFT, one PAD/AFT/SHL and one AFT have been partially destroyed and two AFT and two AFT/SHL sites have been destroyed. Jacobes (draft not available) undertook an assessment in 2015 of part of the

project area in the south as part of an assessment for the proposed M1 Pacific Motorway extension to Raymond Terrace. Based on site cards and a memo from Jacobes (2017) providing a brief summary of the findings, an Aboriginal Cultural Heritage Assessment was undertaken where a number of PADs were identified. Test excavations were then undertaken and three sites identified, two of which continue into the current project area: Heatherbrae M12RT 2 (AHIMS ID 38-4-1749) dune crest located in the south of the project area and Heatherbrae M12RT 3 (AHIMS ID 38-4-1750) dune located along the eastern boundary of the project area (tail end within the project area). Heatherbrae M12RT 2 (AHIMS ID 38-4-1749) test excavation uncovered 29 artefacts in total. Seven of fifteen test pits contained artefacts that included IMTC and silcrete flake pieces and few flakes and broken flakes. The extent of the site remains unknown and no further information is available at this time. Heatherbrae M12RT 3 (AHIMS ID 38-4-1750) test excavation uncovered 228 artefacts in total. Seventeen of twenty-three contained artefacts with the highest density occurring outside the project area. Artefacts included IMTC and silcrete flake pieces and few flakes and broken flakes. However, the extent of the site remains unknown and no further information is available at this time.

Based on the AHIMS search, local assessments and the Jacobs test excavation results, it was predicted that there was a high potential for sites to be identified on the elevated dunes within the project area. Sites will likely include artefact scatters with a range of raw materials (tuff, mudstone, silcrete, quartz) and artefact types (flakes, broken flakes, flake pieces, cores with reduced numbers of backed artefacts and/or microliths). Whilst the artefacts are expected to be relatively dated to the Holocene, the project area is situated on Pleistocene deposits and as such Pleistocene artefacts may also be present at depth. Isolated finds were expected to be located across the project area due to both the nature of hunting and gathering activities (background scatter of discarded artefacts) and land use activities that would have displaced any cultural materials.

The survey was undertaken with site officers from the RAPs and the project area was found to be highly disturbed through past land uses. Visibility was excellent over approximately half of the project area but limited in other areas by grass cover and leaf litter. Exposures were high and included erosion and tracks. The effective coverage for project was 50.38%. The results of the survey identified two new isolated finds and one PAD:

- IEH1 (38-4-1937), an isolated tuff flake was located in the southern portion of SU2a (slope) in a highly disturbed context. The area had been subject to long-term clearing, farming and logging. Located in an exposure, visibility was excellent at 90% and exposures 100% and there is little to no potential for in situ deposits.
- IEH2 (38-4-1936), an isolated grey silcrete flake piece was located SU3b (low lying/swampy) in a highly disturbed context. The area had been subject to long-term clearing, farming and logging. Located in an exposure, visibility was excellent at 80% and exposures 100% and there is little to no potential for in situ deposits.
- The crest in the north-eastern portion of the project area has been identified as a PAD (IEH/PAD). The crest is located within an environment similar to site M12RT2 (38-4-1749) that would have provided resources during times of rain and being elevated and overlooking the low land provided a dry area for camping and/or hunting and gathering.

The survey identified that the project area had been impacted throughout by clearing, logging, farming, sand mine/quarry, electricity easements, a dam, tracks and flooding. The two isolated finds were located in a highly disturbed context. However, sites M12RT2 (38-4-1749) and M12RT3 (38-4-1750) are located on elevated dune crests and contain artefacts at depth and from available information, may be in situ (at depth). Thus, it appears that subsurface sites may be present in the PAD at depth and may be in situ.

An archaeological test excavation program was undertaken across the PAD. The results identified a highly disturbed PAD throughout with burnt pine bark at depth, pieces of metal and plastic at varying depths along with very deep root systems, charcoal and small amounts of road base at depth. No cultural materials were recovered during the test excavation and the test excavation provided clear evidence of disturbances and as such the PAD was reassessed as not a PAD. Consistent with the local and regional area, elevated landforms were the preferred location for past Aboriginal land use, specifically camping and/or hunting and gathering. Additionally, higher density sites are closer to reliable water sources and drop off in numbers and density with distance from reliable water. This appears to be the case for site M12RT3 (38-4-1750) whereby the test pits with the higher density artefacts were closer to Windeyers Creek and M12RT2 (38-4-1749) being located on an elevated dune within a waterlogged area appears to contain moderate density artefacts.

Sites IEH1 (38-4-1937) and IEH2 (38-4-1936) are very well represented throughout the area and were assessed as being of low scientific significance. The RAPs assessed IEH 1 and IEH2 (38-4-1936) as being of low cultural significance. Sites M12RT2 (38-4-1749) and M12RT3 (38-4-1750) are well represented throughout the area and were assessed as being of moderate scientific significance. The RAPs assessed M12RT2 (38-4-1749) and M12RT3 (38-4-1750) as being of high cultural significance.
Impacts from the proposed development have been examined. The results of the assessment indicate that the two isolated finds (IEH1 (38-4-1937) and IEH2 (38-4-1936)) will be totally impacted on by the proposed development. These sites are highly disturbed, well represented and no potential for in situ deposits. The northern half of site M12RT2 (38-4-1749) will be impacted on by the proposed development. This site is between 500-600mm below the surface with some artefacts down to 900mm. A very small portion of the western side of site M12RT3 (38-4-1750) will be impacted on by the proposed development. This site is between 200-300 and 700-800mm below the surface. The cumulative impact to Aboriginal heritage in the area is limited as:

- the net development footprint (i.e. the area of direct impact) is small and does not affect a high proportion of any particular landform present within the region;
- a comparable suite of landforms (dunes, slopes) that are expected to, and do contain a similar archaeological resource occur in multiple contexts both within the local area and throughout the region;
- the majority of the project area is low lying waterlogged swampy land that is highly disturbed;
- the high-density deposits identified to date occur outside the development footprint;
- the placement of the development within this area, in particular over approximately 200 metres west of Windayers Creek within the disturbed context, ensures the cumulative impacts are focused in the areas of lower potential and therefore are kept to a minimum. That is, the higher density of artefacts at M12RT2 38-4-1749 and M12RT3 38-4-1750 occur outside the development and will not be impacted upon; and
- as the dense deposits will not be impacted upon, there is an opportunity to retain a representative archaeological and cultural resource for the local area.

Following this, an AHIP was obtained to undertake a community collection of AHIMS site #38-4-1937 (IEH1) and AHIMS site #38-4-1936 (IEH2) and salvage excavation of AHIMS site #38-4-1749 (M12RT2). A community collection of IEH1 (38-4-1937) and IEH2 (38-4-1936) was undertaken by the RAPs and the two isolated finds were not relocated. A total of 100 salvage pits (1m x 1m) along a 50-metre x 2 metre transect were completed across the area of site 38-4-1749. Of the 64 artefacts from 38-4-1749, tuff was the most common stone material identified comprising 39 items (61%), followed by silcrete at 22 items (34%) and mudstone with 2 items (3%) and one unknown raw material type. The site is overwhelmingly dominated by flake pieces with 34 items (53%) followed by flakes (17: 27%) and 12 (19%) broken flakes (including proximal, medial, distal and longitudinal) and one bladette. Of the 17 complete flakes, 15 had a faceted platform, indicating later stage flake production

and platform preparation. One platform was an unmodified natural surface (cortex) which indicates earlier stages of flake production from the core, one was a focal platform (poor knapping control) and one platform type was unknown. Seven of the artefacts with a facet platform had a feather termination indicating a high degree of skill. Two of the artefacts with facet platforms had plunging terminations that are typically caused by excessive force (unskilled knapper) but may also be initiated when a fracture follows a distinct ridgeline that passes beneath the core. The artefact with the focal platform and plunging termination is also indicative of an unskilled knapper. Four artefacts with the facet platform have step terminations indicating poor knapping skill. Overall, of the 17 flakes, eight (including the bladette) indicate good knapping control and ability and the remainder indicate poor knapping control and ability. The potential age of the cultural deposits is assessed based on artefact typology and the one bladette present indicates that this artefact, if not the associated deposits, is inferred to date within the last 4,000 years BP. The artefact types and raw materials are consistent with sites both locally and regionally. Site 38-4-1749 contained evidence of nonspecific knapping activities with minimal tool manufacturing (one bladette) and no food preparation (no artefacts with use wear). The dune where 38-4-1749 was located was within a flood prone area with the closest semi fresh water source being located approximately 900 metres to the north west (Windeyers Creek) and the Hunter River 2.3 kilometres to the east. The evidence recovered during the salvage indicates that this area was utilised more for transitory hunting and gathering activities.