AN ABORIGINAL ARCHAEOLOGICAL ASSESSMENT OF A NEWCASTLE CITY COUNCIL PROPERTY AT THE CORNER OF LENAGHANS DRIVE AND JOHN RENSHAW DRIVE, BERESFIELD, LOWER HUNTER VALLEY, NSW.

A report to
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by

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EXECUTIVE SUMMARY

South East Archaeology was commissioned by Newcastle City Council to undertake an Aboriginal archaeological assessment of a property located at the corner of Lenaghans Drive and John Renshaw Drive, Beresfield, in the lower Hunter Valley of New South Wales.

The property measures approximately 130 hectares in size. It is bounded to the north by the New England Highway and John Renshaw Drive, to the west by Lenaghans Drive, to the south by the Black Hill rural-residential sub-division and to the east by Hexham Wetlands.

Newcastle City Council is seeking to sell the property. Future development of the property is not currently specified, although the majority of it is presently zoned 2(a) Residential. The archaeological investigation was commissioned to identify what Aboriginal heritage resources are present and what potential constraints they may pose to future development proposals.

The archaeological investigation proceeded by recourse to the Aboriginal and environmental background of the district and the construction of a predictive model of site location for the property. A field survey was undertaken in November 1997, with the assistance of the Mindaribba Local Aboriginal Land Council, to test the predictive model of site location.

Twelve locations containing archaeological evidence were identified during the survey, comprising seven stone artefact scatters and five isolated artefacts. In addition, one previously recorded artefact scatter and an isolated artefact are located within the property. Few trees with potential to host Aboriginal scars or sandstone outcrops with potential to host grinding grooves were identified within the property.

Despite generally low conditions of archaeological visibility along the survey transects, the level of survey coverage enabled an effective assessment of the identified and potential archaeological resources to be made. The results of the survey enabled reassessment and refinement of the predictive model of site location. There is a moderate or high potential for artefact scatter sites to occur on most landform units within the property. Evidence from surrounding areas with similar environmental contexts demonstrates that a low density scatter of artefacts is likely to be present across virtually the entire elevated portion of the property, with occasional areas of higher density representing specific activities (e.g. stone tool reduction) or focused occupation (repeated camping).

Assessment of the significance of the identified sites is constrained by the limited information currently available about their extent, nature of contents, sub-surface deposits and level of integrity. Many of the artefact occurrences and the potential archaeological resource within the property have potential to be of significance within a local context, particularly where deposits of higher integrity exist and where evidence representing specific activity areas (e.g. hearths, knapping floors) or focused occupation may be present.

Strategies are discussed for the conservation and management of the Aboriginal sites identified and the predicted archaeological resource. Strategies potentially available to meet necessary regulatory approvals (under the National Parks and Wildlife Act 1974), and therefore enable progression of any development proposal, include: sub-surface investigations of sites and zones of potential archaeological resources to determine the extent and integrity of deposits, nature of site contents and site significance; salvage of sites through surface collection and/or excavation; preservation of identified sites or zones of potential archaeological resources within open space; and application for Consent to Destroy permits for identified sites from the National Parks and Wildlife Service.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2. Environmental Context</td>
<td></td>
</tr>
<tr>
<td>2.1 Overview</td>
<td>4</td>
</tr>
<tr>
<td>2.2 Topography</td>
<td>4</td>
</tr>
<tr>
<td>2.3 Geology</td>
<td>5</td>
</tr>
<tr>
<td>2.4 Soils</td>
<td>6</td>
</tr>
<tr>
<td>2.5 Flora and Fauna</td>
<td>7</td>
</tr>
<tr>
<td>2.6 Climate</td>
<td>9</td>
</tr>
<tr>
<td>2.7 Environmental Reconstruction</td>
<td>10</td>
</tr>
<tr>
<td>2.8 Recent Land Use</td>
<td>11</td>
</tr>
<tr>
<td>3. Aboriginal Archaeological Context</td>
<td>12</td>
</tr>
<tr>
<td>3.1 Previously Recorded Sites</td>
<td>12</td>
</tr>
<tr>
<td>3.2 F3 Freeway</td>
<td>12</td>
</tr>
<tr>
<td>3.3 Holmwood Industrial Estate</td>
<td>15</td>
</tr>
<tr>
<td>3.4 Black Hill Sub-Division</td>
<td>16</td>
</tr>
<tr>
<td>3.5 Relevant Studies in Close Proximity to the Study Area</td>
<td>18</td>
</tr>
<tr>
<td>3.6 Relevant Studies West and North-West of the Study Area</td>
<td>18</td>
</tr>
<tr>
<td>3.7 Relevant Studies on the Southern Margin of Hexham Wetlands</td>
<td>20</td>
</tr>
<tr>
<td>3.8 Relevant Studies Around Other Lower Hunter Wetlands</td>
<td>22</td>
</tr>
<tr>
<td>3.9 Overview</td>
<td>23</td>
</tr>
<tr>
<td>4. Aboriginal Culture</td>
<td>28</td>
</tr>
<tr>
<td>4.1 Group Identity and Boundaries</td>
<td>28</td>
</tr>
<tr>
<td>4.2 Subsistence Resources</td>
<td>30</td>
</tr>
<tr>
<td>4.3 Material Culture</td>
<td>31</td>
</tr>
<tr>
<td>4.4 Aspects of Society</td>
<td>34</td>
</tr>
<tr>
<td>4.5 Population</td>
<td>35</td>
</tr>
<tr>
<td>4.6 Relationship with Settlers</td>
<td>36</td>
</tr>
<tr>
<td>4.7 Aboriginal History</td>
<td>37</td>
</tr>
<tr>
<td>4.8 Ethnohistorical References to Aboriginal Sites</td>
<td>39</td>
</tr>
<tr>
<td>5. Historical Context</td>
<td>41</td>
</tr>
<tr>
<td>6. Predictive Model of Site Location</td>
<td>44</td>
</tr>
<tr>
<td>7. Methods</td>
<td>47</td>
</tr>
<tr>
<td>8. Results And Discussion</td>
<td>52</td>
</tr>
<tr>
<td>9. Aboriginal Consultation</td>
<td>60</td>
</tr>
<tr>
<td>10. Significance Assessment</td>
<td>61</td>
</tr>
<tr>
<td>10.1 Assessment Criteria</td>
<td>61</td>
</tr>
<tr>
<td>10.2 Significance of Sites Located Within the Study Area</td>
<td>62</td>
</tr>
</tbody>
</table>
### FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Location of Study Area and Aboriginal Sites</td>
<td>2</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Plan of Study Area</td>
<td>3</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Location of Transects Surveyed</td>
<td>51</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Location of Aboriginal Sites</td>
<td>58</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Zones of Archaeological Potential</td>
<td>59</td>
</tr>
</tbody>
</table>
1. INTRODUCTION

Peter Kuskie, of South East Archaeology, was commissioned by Newcastle City Council in October 1997 to conduct a preliminary Aboriginal archaeological assessment of a Council owned property at Beresfield, in the lower Hunter Valley of New South Wales.

The 130 hectare property is bordered by the north-western margin of Hexham Wetlands, the New England Highway, John Renshaw Drive, Lenaghans Drive and a rural-residential subdivision at Black Hill (Figure 1). The property is vegetated by a eucalypt forest, partially cleared for pastures, vehicle tracks, a 330 kV electricity transmission line easement and a water pipeline easement. The property is characterised by undulating, low gradient terrain, consisting of a broad low ridge, several broad spurs leading to Hexham Wetlands and associated slopes and drainage lines (Figure 2).

The investigation proceeded by recourse to the archaeological and environmental background of the locality, followed by the construction of a predictive model of site location. A field survey was undertaken with the assistance of the Mindaribba Local Aboriginal Land Council to test the predictive model. The study was completed in November 1997.

The general aims of the archaeological assessment are to:

- construct a predictive model of Aboriginal site location for the study area;
- undertake a preliminary archaeological survey to test the predictive model of site location and identify and record any Aboriginal sites and zones of potential archaeological resources within the study area;
- provide details of any sites in accordance with NSW National Parks and Wildlife Service requirements;
- assess the significance of any Aboriginal sites located during the survey;
- identify potential constraints to development of the property presented by the identified and potential Aboriginal archaeological resource;
- consult with the local Aboriginal community (Mindaribba Local Aboriginal Land Council);
- make recommendations for the conservation and management of any Aboriginal sites and zones of potential archaeological resources identified; and
- prepare an archaeological report to meet the standards required by the NSW National Parks and Wildlife Service.
Figure 1: Location of Study Area and Aboriginal Sites (Beresfield 9232-3-N 1:25,000 topographic map).

KEY:
- 38.4.329 Aboriginal site recorded on NPWS register
- 1 Aboriginal site recorded during present survey

An Aboriginal Archaeological Assessment of a Newcastle City Council Property at the Corner of Lenahans Drive and John Rendaw Drive, Beresfield, Lower Hunter Valley, NSW. Peter J. Kukie 1997.
Figure 2: Plan of Study Area (Newcastle City Council).

An Aboriginal Archaeological Assessment of a Newcastle City Council Property at the Corner of Lansdowne Drive and John Renshaw Drive, Beresfield, Lower Hunter Valley, NSW. Peter J. Rudloe 1997.
2. ENVIRONMENTAL CONTEXT

2.1 Overview

The study area is located immediately south-west of the Beresfield urban area. It is situated between grid references 372000 and 373750 east and 6367000 and 6368750 north on the Beresfield 9232-3-N 1:25,000 topographic map (Figure 1). The study area measures approximately 130 hectares in size, although a portion of this comprises the western fringes of Hexham Wetlands (Figure 2). The wetland is zoned 7(b) Environmental Protection (Wetlands) under the Newcastle Local Environmental Plan 1987, while the remainder of the property is zoned 2(a) Residential. The New England Highway and John Renshaw Drive form the northern boundary of the property, Lenaghans Drive the western boundary, a rural-residential estate at Black Hill the southern boundary and Hexham Wetlands and the 'Glenrowan' property the eastern boundary. The western portion of the property lies within the Ironbark Mine Subsidence District.

2.2 Topography

The study area is located within the coastal lowlands of the lower Hunter Valley. It is situated within the East Maitland Hills region, comprising undulating low hills and rises (Matthei 1995). The property is dominated by a broad, low ridge, trending in a northerly direction to Weakleys Flat (Figure 2). The ridge is one of several descending to the wetlands from Black Hill and Black Hill Spur, several kilometres to the south-west (Figure 1). In the north-east of the property, the ridge crest fans out in the form of a broad, low gradient spur, descending eastward to the margin of Hexham Wetlands (Plate 11). A similar, but smaller, low gradient spur descends eastward to the wetlands from the mid-section of the property (Plate 5). Hexham Wetlands extends into the property along the eastern margin. There are typically short, steep side-slopes bordering the wetlands (Plates 5, 11). A series of short gullies line the margin of the wetlands in the south-east (Figure 2). The remainder of the property primarily consists of low gradient simple slopes, associated with the ridge and spurs. Slopes are typically less than four degrees in gradient. Landform units present within the study area include ridge crests, spur crests, simple slopes, basal slopes, gullies, drainage depressions and swamp. Elevation varies between 4 and 30 metres above-sea-level.

The drainage depressions consist of several minor, ephemeral drainage lines. These are typically first order watercourses with small catchments, comprising only the adjacent slopes. A drainage line runs parallel and adjacent to Lenaghans Drive, flowing northward to Weakleys Flat (Plate 12). A second minor drainage line lies mid-way along John Renshaw Drive and also drains northward to Weakleys Flat. Several minor drainage lines in the north-eastern corner of the property lead eastward to Hexham Wetlands. Run-off from the ridge crest also drains through the gullies bordering the swamp in the south-eastern portion of the study area.

The one in one hundred year flood level is marked by the 3.65 metre contour line within this locality. Below this level, to the east and south, lies Hexham Wetlands, the largest freshwater swamp on the north coast of New South Wales (NPWS 1996). Hexham Wetlands extend over a 2500 hectare area east to Shortland and Hexham and south to Minmi. The Hunter River at Hexham is located three kilometres east of the study area. The urban areas of Beresfield, Tarro, Woodberry and Thornton are situated on low undulating terrain north of the study area. Adjacent to them lie Tarro Swamp and Woodberry Swamp (Figure 1).
2.3 Geology

The underlying geology of the elevated landform units consists of Tomago Coal Measures of Permian age (Engel 1966, Ives 1995). The Tomago Coal Measures are divided into three formations, of which the Dempsey Formation is present within the study area. This consists mainly of shales and mudstones, with subordinate sandstones, thin coal seams and tuffaceous clays (Engel 1966:23). Minor, isolated exposures of sedimentary rock are visible within the study area, including sandstone. Gravels consisting of sandstone, mudstone and minor quartz and volcanic tuff are present. Also present in the local area are glacial erratics, or ‘dropstones’ (Nashar 1964). These are boulders measuring up to 1.25 metres in diameter, often of quartz feldspar porphyry, that were deposited from a melting glacier (Nashar 1964:63). Quaternary alluvial deposits occur in the Hexham Wetlands, consisting of gravels, sands, silts and clays.

The nature of the geology has several implications for Aboriginal land use within the property. Sandstone exposures in watercourses are typically used for shaping and sharpening ground-edge hatchets. The abrasion of volcanic stone hatchets against the softer sandstone, aided by the use of water to remove debris, results in the creation of distinctive grooves. Any sandstone exposed within watercourses may have been used for this purpose.

The majority of Aboriginal stone artefacts found in this region are manufactured from two types of locally available material: silcrete and silicified volcanic tuff (Kuskie & Kamminga in prep.). Silcrete is a brittle, intensely indurate rock composed mainly of quartz clasts cemented by a matrix which may be well-crystallized quartz, cryptocrystalline quartz or amorphous (opaline) silica (Langford-Smith 1978:3). The texture of silcrete reflects that of the host rock and clasts may range in size from very fine grains to boulders. Silcrete is produced by an absolute accumulation of silica, which is made available by chemical weathering. The formation of silcrete therefore requires the removal of most elements, other than silicon, in the host material. Silcrete is normally grey in colour, but can be whitish, red, brown or yellow. It shatters readily into sharp, angular pieces with a conchoidal fracture and newly broken rocks have a semi-vitreous sheen (Langford-Smith 1978:4).

The flaking properties of silcrete and its availability in alluvial and terrace gravels of the Hunter River (including nearby at Thornton - Kuskie 1994b, Bolwarra Heights - Baker 1996 pers. comm. and possibly north of John Renshaw Drive - ERM Mitchell McCotter 1995a, 1996a) made it attractive to the local Aboriginal people. However, the quartz clasts within the stone could sometimes present difficulties with knapping very fine artefacts (such as Bondi points). The flaking properties of silcrete were often altered by Aboriginal people, by a process known as heat treatment. This process was in widespread use in the Hunter Valley (cf Baker 1992, 1996, Haglund et al 1992, Haglund & Rich 1995, Hiscock 1986, Koettig 1992, 1994, Kuskie 1994b, Rowney 1992 and Silcox & Ruig 1995). Controlled heating to specific temperatures and slow cooling alters flaking qualities. The original poorly ordered, strongly interlocking microfabric becomes more equigranular and better crystallized (Domanski & Webb 1992:612). In the Hunter Valley, heat treatment is often accompanied by a change in colour of the stone to red or pink, as iron oxides are altered to haematite, and also results in a distinctive vitreous lustre.

Previously within the Hunter Valley, silicified volcanic tuff has been commonly identified by archaeologists as indurated mudstone (deriving largely from the work of Hughes 1984). Recent work by Kuskie and Kamminga (in prep.) has confirmed the view of some archaeologists (cf Kamminga) that much of what has been classified as indurated mudstone is actually silicified volcanic tuff. Other archaeologists have recognised the presence of silicified tuffs in assemblages, particularly the distinctive Nobby Tuff ('Merewether Chert'), or that confusion
exists over raw material identification, but have not identified that most material classed as 'mudstone' is in fact silicified tuff. Tuffs are composed of fine material which has been hurled from the vent of a volcano during a violent explosive eruption. This volcanic ash consolidates to the harder rock tuff, once it settles to land or sea (Nashar 1964). When exposed to air or water, tuff tends to undergo chemical weathering and becomes silicified. Thus it transforms from a chalky material to a very hard stone which breaks with a conchoidal fracture. Volcanic tuffs occur in widespread seams throughout the Hunter Valley and are occasionally exposed in drainage lines (e.g. around Stockington and Minmi) or in cliff faces (e.g. Nobby's Head) (Dean-Jones 1990, Kuskie & Kamminga in prep.).

The presence of silcrete and silicified tuff raw materials within the local area are a factor relevant to Aboriginal use of the landscape and have implications for the potential nature and distribution of artefacts within the study area.

2.4 Soils

Soils across the elevated portions of the property typically belong to the Beresfield Soil Landscape (Matthei 1995). The topsoil (be1), or A horizon, has been described at its type location (within the study area near John Renshaw Drive), as a friable brownish black loam occurring at 0-10 centimetres in depth. Underlying this is a hardsetting dull yellowish brown sandy loam (be2) (topsoil - A horizon). It typically ranges from a sandy loam through clay loam to fine sandy clay loam and occurs at 10-15 cm depth at the type location. The B2 horizon (be3) is a pedal brown plastic mottled clay, occurring at a depth between 15 and 120 cm. On moderately well drained crests, generally 5-15 cm be1 overlies 5-30cm be2. On side-slopes, 5-10 cm be1 overlies 10-30 cm be2. Where disturbed, be1 has often been lost to erosion and be2 is exposed at the surface. On better drained upper slopes up to 10 cm be1 overlies 10-35 cm be2. On some lower slopes and more poorly drained flat low crests up to 10 cm be1 overlies 10-30 cm be2 (Matthei 1995:30-33).

Variations in horizon depths will occur across the current study area in relation to topography, aspect and relative strength of the underlying material. Upper slopes may tend to have shallower soils due to down slope movement of sediment and the reduced capacity to hold water. South and east facing slopes may tend to have deeper profiles than north and west facing slopes, because of less solar radiation and therefore greater availability of water in the soil. Shorter, more gentle slopes generally deliver less sediment to sites down-slope, than do longer, steeper slopes (Ormerod 1996).

These texture-contrast soils are typical of those found throughout much of the Hunter Valley (Hughes 1984). The A Horizon is considered to be Holocene in age and the B Horizon of Pleistocene age (Hughes 1984). Within the Hunter Valley, virtually all artefacts have been located within the A horizon, with dates corresponding to the late Holocene (Hughes 1984, Dean-Jones & Mitchell 1993).

There are several implications for Aboriginal heritage within the elevated landform units of the current study area:

a) archaeological deposits are only likely to exist within the shallow A horizon soils and will be of late Holocene age;

b) the depth of archaeological deposits will be related to the depth of the soil profile (specifically the A horizon) in each topographic locality; and
c) post-depositional processes may have affected the integrity of any shallow deposits within the A horizon to varying extents.

Soils bordering Hexham Wetlands along the eastern margin of the property are a variant of the Bobs Farm Soil Landscape (Matthei 1995). The Bobs Farm variant (lfha) comprises low, remnant, lake shore beach deposits, up to one metre in relief, 15 m in width and 200 m in length. Soils consist of up to 20 cm of dark brown loose loamy sand overlying 120 cm of greyish yellow brown loose coarse beach sand which overlies over 100 cm of greyish yellow brown saturated sandy clay loam (Matthei 1995:188-189). These may be of early to mid-Holocene age (NPWS Site Record 38-4-358). The presence of site 38-4-358 in a remnant sand dune in the ‘Glenrowan’ property, near the New England Highway, indicates that evidence of Aboriginal occupation may exist within such deposits.

Soils within Hexham Wetlands belong to the Hexham Swamp Soil Landscape (Matthei 1995). Typically a black pedal silty clay loam (A horizon) of 15-60 cm thickness overlies over 200 cm of saturated grey sticky plastic clay. Quaternary estuarine sediments underlie these soil units (Matthei 1995:220-221).

2.5 Flora and Fauna

The availability of floral and faunal resources, along with potable water, are primary factors relating to patterns of Aboriginal land use, the ability to detect the archaeological evidence of that use, and the preservation of that evidence after deposition.

The natural vegetation of the study area has been altered in places through recent land use practices. However, a tall open eucalypt forest remains over much of the property. In the Beresfield Soil Landscape, this forest typically consists of Eucalyptus maculata (spotted gum), E. fibrosa (broad-leaved ironbark), E. paniculata (grey ironbark), E. eugenioides (thin-leaved stringybark), E. punctata (grey gum) and E. oblonga (narrow-leaved stringybark) (Matthei 1995). Story (1963:141) also records Angophora costata (smooth barked apple), A. floribunda (rough barked apple), E. aeminioides (white mahogany), E. gummifera (red bloodwood) and E. pilularis (blackbutt) as occurring within the broader Beresfield Land System. The understorey typically contains Bursaria spinosa (blackthorn), paperbarks (e.g. Melaleuca nodosa) and wattles (e.g. Acacia falcata) (Matthei 1995). E. tereticornis (forest red gum) occurs on some lower slopes. In drainage lines, M. styphelioides (prickly leaved paperbark), Backhousia myrtifolia (grey myrtle), Alphitonia excelsa (red ash) and Lantana camara (lantana) are common (Matthei 1995).

Selective harvesting of timber has resulted in the removal of a number of larger trees. In some areas (central portion of the ridge crest and eastern portion of the main spur) only sparsely scattered trees remain. These areas are dominated by pasture grasses.

The cover of vegetation within the study area acts to reduce ground surface visibility and thereby reduces the potential to identify archaeological evidence during a field survey. Most artefact occurrences within the Hunter Valley have been identified only when visible on exposures created by sheet erosion (Dean-Jones & Mitchell 1993).

The preservation of any archaeological evidence will also be affected by the vegetation cover, through processes known as ‘bioturbation’. Bioturbation is important in three ways: through mineral turnover in the nutrient cycle, physical movement of soil by mixing and mounding, and the creation of micro-relief (ant and termite mounds, tree-fall pits and mounds) (Mitchell 1988:52). Rainsplash on bioturbated soils can facilitate sheet erosion, the movement of fine
material downslope. These processes can affect archaeological sites in several ways: by altering the horizontal and vertical relationship of artefacts; by altering assemblage contents through the effects of sheetwash erosion on small artefact size classes or by the dispersal of features such as hearths; by changing artefact densities through the effects of removal or addition of sediments; and by deposition of sediments burying (and therefore obscuring evidence of) archaeological deposits.

Briggs (1978) identified four different vegetation types within Hexham Wetlands. The portion of Hexham Wetlands within the study area is identified as being in the north-western zone of freshwater grassy swamps. This consists of submerged aquatic plants, reeds, paspalum and agricultural fodder plants. Waterhouse (1981) notes that this area has mainly semi-permanent water. Relic paper-bark swamp scrub of paperbarks (e.g. *M. linariifolia*, *M. ericifolia*) and swamp she-oak (*Casuarina glauca*) are also present in the portion of swamp between the two spurs (Plates 1, 5). Originally the margins of Hexham Swamp were vegetated with a thick growth of trees, possibly swamp oak around the outer fringe and paperbark on the inner fringe, with swamp mahogany (*E. robusta*) and cabbage tree palms (*Livistona australis*) in poorly drained, low lying areas (Waterhouse 1981).

Historical observations also reveal evidence about the vegetation cover at the time of European settlement. A plan of Newcastle and 'Port Hunter' dating from the 1840's marks Hexham Wetlands as an area of 'teatree and swamp' (Anon c.1840's). Backhouse (1843:399) records the view from Raymond Terrace in 1843 as consisting of 'one vast wood, interrupted by a few open swamps'. Backhouse (1843:399) noted on the sides of streams species of yam eaten by the Aboriginaels, also *Eugenia trinervis* and another myrtle shrub, and *Logania floribunda*. Lieutenant Breton (1833) observed at Maitland a thick vine brush, very difficult to penetrate and a gigantic fig tree. Peter Cunningham observed in 1825 the area towards Maitland from Newcastle as being low and swampy, covered with stunted brush. Further inland he observed fertile locations, which were well watered but heavily timbered and brushy. Back from the Hunter River the country consisted of rising hills of 'inferior' soil, with fertile flooded vine brushes, watered by lagoons connected to the river. The lagoons contained abundant fish and in summer when the water was low, 'the natives wade in and actually drag out cartloads thereof, including immense eels' (Cunningham 1827:78-9).

In addition to the abundant floral resources available for Aboriginal exploitation within Hexham Wetlands, there were a variety of faunal resources. Over two hundred bird species have recently been recorded in the Hexham Wetlands catchment (NPWS 1996). Common species include egrets, ibises, herons, spoonbills, ducks, swans and a variety of raptors. Over ten thousand waterfowl were recorded on Hexham Swamp during the 1970's.

There are few records of native mammals from within the Hexham Wetlands. However, a survey of freshwater meadows along the western edge of Hexham Wetlands revealed eleven frog species and one tortoise. Reptiles such as the red-bellied black snake (*Pseudechis porphyriacus*), swamp snake (*Hemiaspis signata*), striped skink (*Ctenotus robustus*) and fence skink (*Cryptoblepharus boutoni*) occur (NPWS 1996). Introduced animals such as pigs (*Sus scrofa*), foxes (*Vulpes vulpes*), domestic dogs and cats, black rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), house mouse (*Mus musculus*), rabbits (*Oryctolagus cuniculus*) and hares (*Lepus carposis*) are now also present (NPWS 1996). Some of their activities may have promoted compaction or mixing and mounding of soil, resulting in impacts to the integrity of archaeological deposits.

(Waterhouse 1981) observes that platypus (*Ornithorhynchus anatinus*) and water rat (*Hydromys chrysogaster*) are widespread in the Hunter region and occur in swamps, lakes,
rivers and creeks. The black-tailed or swamp wallaby (*Wallabia bicolor*) can live in a variety of habitats, particularly swamp forests and wet meadows adjacent to swamps. Freshwater fish include freshwater catfish (*Tandanus tandanus*), short-finned eel (*Anguilla australis*) and long-finned eel (*Anguilla reinhardtii*); would have been present in the swamp. Enright (1914) observed that since European settlement, the koala has become extinct from the lower Hunter and the dingo rare. A range of probably locally available food sources is listed by Enright (1914), including wombat, grey kangaroo, wallaroo, red wallaby, common kangaroo rat, flying fox, lizards, goanna, pademelon and bandicoot, with opossum, ring-tailed opossum, flying squirrel and native cats being less common. Fish include bass, mullet, herring, minnow, bullrout and gudgeons and also ocean species visiting the estuaries, including eel, estuary perch, sea mullet, sand flathead, black bream, jewfish and garfish, were noted (Enright 1914). Shell fish would have been present, the populations varying in relation to salinity and temperature changes, disease and fluctuations in predator populations (Dean-Jones 1990).

From the sources discussed above, it is evident that a range of plants and animals would have been available for exploitation by Aboriginal occupants of the area, many on a seasonal basis. Ethnohistorical observations of subsistence activities are documented in Section 4.2. Hence of great relevance to Aboriginal use of the study area is the presence of two major resource zones, the freshwater swamp and the dry sclerophyll forest, along with the presence of potable water on a semi-permanent basis in the swamp and on an ephemeral basis in the minor watercourses. Combined with the presence of level and low gradient landform units suitable for camping, and the locally available stone raw materials (silicified tuff and silcrete), the current study area presents a generally favourable location for Aboriginal occupation.

A factor possibly less favourable for Aboriginal occupation is the presence of thirteen species of mosquito, which breed in the non-draining salt pans and marshes of Hoxham Wetlands. The most common species are the saltmarsh mosquito (*Aedes vigilax*) and the common banded mosquito (*Culex annulirostris*). Also present is the Hoxham grey mosquito (*Aedes alternatus*). Mosquitoes are worst during summer months (NPWS 1996). This is when the breeding cycles of the main mosquito species occurs. The female requires a blood meal to produce eggs, which are deposited on moist soil or the bases of small plants. The eggs hatch after being inundated by water from rain or tides (Department of Public Works 1972). It is hypothesised that without the aid of breezes to disperse the mosquitoes, conditions for camping may have been unfavourable adjacent to breeding grounds, at least during the summer months. At other times of the year, or with favourable winds, or even through behavioural modifications such as using smoke from fires, mosquitoes may have been less of an inconvenience or factor in site location for Aboriginal people.

### 2.6 Climate

A warm temperate climate with a maritime influence prevails in the area. Summers are warm to hot and humid, and winters are cool to mild. Rainfall is summer-autumn dominated due to the predominance of easterly trade winds at this time (Matthei 1995). In winter, the region has westerly winds and frosts form regularly inland. In summer, winds are onshore from the ocean and augmented by north-easterly or easterly sea breezes. Low pressure troughs bring north-westerlies and then southerlies. Autumn and spring are transition periods with considerable rain in autumn from low-scale pressure systems in the Tasman Sea (Bridgman & Oliver 1995). Annual average rainfall varies between 1000 and 1200 millimetres (RTA 1993b). Temperature minimums decrease further inland, while the maximums increase further inland (Bridgman & Oliver 1995).
2.7 Environmental Reconstruction

Reconstructing the landscape prior to European settlement is relevant to understanding the nature of Aboriginal occupation in the region and the post-depositional processes which may have affected any evidence of occupation. As archaeological evidence indicates Aboriginal people were present in the region within at least the last 20,000 years (Koettig 1987), knowledge of climatic changes, and the landforms and floral and faunal resources present, is important. The recent evolution of the lower Hunter Valley is discussed below.

The Hunter Valley is a mature riverine estuary. Formation of the estuary is closely related to glacio-eustastic fluctuations in sea level that have occurred many times over the past million years. These cycles have frequencies of 100,000 years and amplitudes of 100-120 metres. The last cycle began 125,000 years ago with the Last Interglacial phase of high sea levels and warm temperatures. During the Last Interglacial conditions were similar to present with an extensive deltaic floodplain in the lower valley. Raised estuarine shell beds described by David and Etheridge (1890) belong to this phase of sedimentation, indicating the sea level was about five metres higher than present. The associated terrace deposits are remnants of a Last Interglacial floodplain that covered the estuary and were up to ten metres higher than the present floodplain in the Maitland area (Roy et al 1995:70-71). Remnants of these Pleistocene terraces have been identified by Roy (et al 1995) and Roy and Boyd (1996) at various locations in the valley, but none occur within the current study area.

Slow cooling of temperatures and falling sea levels followed, culminating in the last glacial maximum about 24,000 to 17,000 years ago. By the end of the sea regression, the coastline was displaced twenty-five kilometres to the east (present continental shelf) (Roy et al 1995:70-71). The climate was cooler and drier than at present and the Hexham Wetlands environment would have been significantly different.

Deglaciation and melting of ice sheets occurred rapidly from 18,000 years ago and the Hunter River slowly incised its valley. Much of the Pleistocene floodplain deposited around 125,000 years ago was removed by subaerial weathering and lateral migration of the river channels. Post-glacial sea levels rose quickly (about one metre per 100 years) up to 8,000 BP, slowed to half that rate between 8,000 and 6,500 BP and then stabilised (Roy & Boyd 1996:11). As the sea level rose between 18,000 and 6,500 BP the Hunter River retreated as a bay head delta up the valley to Bolwarra, near Maitland, leaving the valley (including the modern day Hexham Wetlands adjacent to the study area) infilled with marine to brackish water in an estuary stretching 32 km inland from the present coastline (Roy & Boyd 1996:74). Marine sand migrated landward at least as far up the Hunter estuary as Hexham. Roy (et al 1995) identifies that the study area is lying on bedrock which includes relict wave formed cliffs, evident along part of the eastern margin bordering Hexham Wetlands.

Once the sea level stabilised, a new cycle of estuarine and deltaic sedimentation commenced in the lower Hunter Valley (Roy et al 1995:70-71). There is some evidence that sea levels may have been about one metre or so higher in the mid-Holocene, due to hydro-isostatic adjustments (Roy & Boyd 1996:11). Since then, with the Holocene stillstand, the sea has remained relatively stable. In the mid-Holocene, the proto Hunter estuary was probably a barrier estuary with a narrow and shallow mouth which restricted tidal ranges to 5-10% of ocean tide. Shells such as *Anadara trapezia* (cockle) and *Pyrazus ebenus* (mud whelk) that live on shallow sand flats are present in sand deposited during that period (Roy et al 1995).

Estuarine environments were most widespread in the mid-Holocene (6000 - 4000 years ago) when the valleys were first drowned, but have since decreased in size as they infilled with
sediment and deltaic flood plains spread to near the present coast (the bay head delta prograded seaward from Bolwarra, infilling the valley) (Roy et al 1995:74). The shoreline changes were accompanied by dramatic and rapid environmental transformations as the shallow, saline estuary was converted to freshwater swamps and terrestrial floodplains. Most of the larger coastal rivers in south-eastern Australia experienced these changes during the late Holocene (last 2,000-4,000 years) (Roy & Boyd 1996:31). Hexham Wetlands adjacent to the study area would have slowly transformed from an estuarine body to the present freshwater swamp.

When the Hunter River was first encountered by Europeans, the lower estuary was a complex region of intersecting tidal channels, tidal flats and mangrove swamps. Substantial changes have occurred to this environment through industrial development, including the building of levees and channel diversions (Roy & Boyd 1996). Prior to these changes to the hydrology of the wetlands, more prolonged standing water could have been expected after rain (Dean-Jones 1992).

2.8 Recent Land Use

Non-Aboriginal land-use practices have affected the study area to varying extents. Timber has been selectively removed and in several places (mid-section of the ridge crest, eastern portion of the main spur), totally cleared and replaced with pasture grasses. Evidence for agricultural practices is absent from most of the property, although some tilling of the soil may have been involved in establishing the pasture grasses. In the clearing on the mid-section of the ridge crest, cultivation has probably occurred, as evidenced by plough lines visible on the Beresfield U5465-8 1:4,000 orthophoto map. Cattle have been grazed on at least the pastures and probably within the forest, during historical times.

A 330 kV electricity transmission line easement traverses the mid-section of the property (Figure 2). Optus Communications's Sydney-Brisbane fibre optic cable traverses the property through this power easement and across the larger spur. Within the broad easement is a well formed gravel road. A water pipeline, which connects with the Chichester Pipeline at Tarro, is located within a second broad easement in the northern portion of the property (Plates 7, 8) (Figure 2). Also within this easement are a well formed vehicle track, an unformed track and a minor electricity transmission line. Along the easement are pumping station buildings (Hunter District Water Board Alfred E. Fry Pumping Station) (Plate 9), a telecommunications tower and an electricity sub-station, within a fenced compound.

A number of fencelines and a series of vehicle tracks, ranging from unformed to well formed, traverse the property (cf. Plates 6, 7). Several minor clearings or areas of ground disturbance exist (e.g. spoil heaps on the ridge crest, within the main transmission line easement and adjacent to the John Renshaw Drive flyover of the New England Highway). Several dams are located in the south-eastern fringe of the swamp and on the ridge within the main transmission line easement. Drainage works have been undertaken adjacent to Lenagahns Drive. A shed, benches, targets and other items relating to an archery range are located on the smaller spur near the main transmission line. Household refuse and car wrecks have been deposited at various locations around the property.
3. ABORIGINAL ARCHAEOLOGICAL CONTEXT

3.1 Previously Recorded Sites

A search was undertaken of the NSW National Parks and Wildlife Service Aboriginal Site Register. 149 sites are listed on the Register within an area of 500 square kilometres surrounding the current study area, comprising 89 artefact scatters, 21 isolated artefacts, 29 grinding groove sites, three middens, two scarred trees, two stone arrangements, one fish trap, one shelter with art and grinding grooves, and one water hole/well.

The results of the register search cannot be regarded as being a representative sample of the total archaeological resource (identified and unidentified sites) present, because only recorded sites are listed on the register, survey biases exist in previous investigations (e.g. confined to small areas of proposed developments), biases exist towards discovery of obtrusive site types which can be recorded by untrained observers, and recent land uses may have obliterated a greater proportion of one site type over another. In addition it is apparent that in several instances, a single site has been attributed multiple register numbers.

Within the current study area two previously recorded sites occur. Site MB2 (NPWS No. 38-4-0329), an artefact scatter recorded by Curran (Resource Planning 1992a) and isolated artefact MB1 (not entered onto the NPWS register). These sites are discussed further below.

Numerous archaeological surveys and excavations have been undertaken within the lower Hunter region, primarily within a commercial contracting framework, but also for academic research. Discussion of the most relevant investigations will highlight the range of site types and variety of site contents in the region, identify typical site locations, and assist with the construction of a predictive model of site location for the study area.

3.2 F3 Freeway

Immediately south of the current study area a series of archaeological investigations have been undertaken of the route of the F3 Freeway (Resource Planning 1992a, Effenberger & Baker, 1996, Kuskie & Kamminga in prep.). A new section of the freeway is being constructed between Minmi and John Renshaw Drive.

The initial study commenced in 1992 with examination of options for the F3 connection between Minmi and the New England Highway at Beresfield (Resource Planning 1992a). Part of Option A03 traverses the north-eastern portion of the current study area, while the Preferred Option involved widening of John Renshaw Drive on the northern boundary of the study area. Curran (Resource Planning 1992a:8) inspected all surface exposures, but noted that conditions of surface visibility were generally very low.

One isolated artefact and one small artefact scatter were located, both along Option A03 and within the current study area. Isolated artefact MB1 (no NPWS number) was recorded at grid reference 773000:6865000 on the Beresfield 1:25,000 topographic map (Resource Planning 1992a:9) (Figures 1, 4). However, the location on Curran’s Figure 3 (Resource Planning 1992a) indicates this grid reference is incorrect and should read 373300:6368600. It is described as a ‘flaked artefact of locally exotic, cream, fine-grained siliceous stone’, situated on a vehicle track. Curran speculates that the raw material may have been obtained from outcrops of Merewether chert near Newcastle (Resource Planning 1992a:9-11). Site MB2 (NPWS No. 38-4-329) was recorded approximately 100 metres away at grid reference 734000:6860000. Again, this reference is incorrect and should read 373430:6368620. It consists of ‘two flaked
pieces of chert' (Resource Planning 1992a:9-11). Presumably these raw materials are silicified volcanic tuff.

Minimal information is presented about the sites, particularly details of conditions of surface visibility, topography, vegetation, potential for further surface artefacts or potential for sub-surface deposits. However, in the significance assessment (Resource Planning 1992a:11-12) Curran states that for site MB2 there 'was no apparent evidence of sub-surface or in situ material' and because of this, there was 'decreasing likelihood of other artefacts at the site'. Curran goes on to state however, that 'it is possible that further material may be exposed during road construction' (Resource Planning 1992a:11). This area in the north-eastern portion of the current study area was delineated as being 'archaeologically sensitive'. The sites were assessed as being of low archaeological significance but important to the local Aboriginal community (Resource Planning 1992a:11).

Option A03 was not pursued by the Roads and Traffic Authority (RTA). Rather, the preferred option of widening John Renshaw Drive and constructing a dual carriageway immediately west of Lenahans Drive, was undertaken. Effenberger (1995) was engaged to monitor initial construction works within several archaeologically sensitive zones identified by Curran (Resource Planning 1992a) at Woods Gully and the wetland fringes near the 'Countyclare' property (between 0.7 and 2.5 km south of the current study area). Several artefacts were located, but low surface visibility elsewhere prevented the identification of any further evidence.

Following requests from the Mindaribba Local Aboriginal Land Council and National Parks and Wildlife Service, sub-surface testing was undertaken over a five week period at these locations (Woods Gully - RTA Zone F5, and near 'Countyclare' - RTA Zones C3 and F4) by Effenberger & Baker (1996).

Baker (1996) directed the test excavations at the Black Hill 2 (Zones C3 and F4) and Woods Gully (Zone F5) sites. Test excavations were confined to the areas of archaeological sensitivity outlined by Resource Planning Pty Ltd (1992a) and by the limits of artefacts observed eroding from the ridge at zone C3. Baker (1996:11) excavated a systematic sample of one square metre units (66 in total) to the surface of the B horizon soil. Trenches were excavated by a backhoe in a grid pattern at 40 m intervals. The C3 zone was sampled in a more limited manner (40 m intervals but over a narrower width of the freeway corridor). Most of the deposit was wet sieved, although some was dry sieved. Two open area excavations were also conducted: 4.25 m² at F5 and 8 m² at F4 (Baker 1996).

The aims of Baker's analysis were to characterise the artefact distributions, identify associations between artefact density and the landscape, characterise the artefact assemblages and compare the assemblages with others in the region (Baker 1996:13-14). Artefacts occurred in the three zones at low densities with marked 'hot spots' where higher densities were present (two at F5 and one at F4). At zones C3 and F5 artefact density averaged 20 and 23 artefacts/m² respectively, while at F5 artefact density averaged 5/m². At F4, high numbers of artefacts were only found on the large spur crest, with an easterly aspect overlooking the watercourse and Hexham Wetlands. At C3 there were indications of higher densities on the north facing mid-slope and lower densities on the crest. Baker argues his results contradict the model that archaeological sites are associated with watercourses (typically within thirty metres). Baker concludes that high densities can occur by creeks where slopes are less than five degrees, but also on elevated landform units of steeper terrain. Low density 'background scatter' (0-10 artefacts/m²) was identified by Baker (1996:15-16) across most of the area.
Several artefacts occurred in the upper B horizon clay at F4 and F5, which Baker (1996:14) interprets as deriving from 'artefact movement down into clay cracks'.

The hand excavation at Woods Gully revealed the highest documented artefact density in the Hunter Valley (Baker 1996:17), with 1,854 artefacts in one square metre (square 12N14E). Surrounding squares contained 1360, 1010, 661, 298 and 102 artefacts.

Silcrete was the dominant raw material and 'indurated mudstone' (silicified tuff) was also common, with Nobby's Tuff identified in small quantities (Baker 1996:19). Backed blades (Bondi points) of 'indurated mudstone', fine grained sedimentary and raw and heat treated silcrete occur. Most occur where they were manufactured (associated with debitage of the same raw material and appearance) and are broken or incomplete. Several exhibit usewear. Microblade debitage (prepared platforms present, parallel sided thin flakes and blades or broken fragments of, small cores with blade scars and evidence of platform preparation by assymetrical alternating flaking pattern) occurs across all areas but at varying densities. Other debitage includes 'expeditiously produced flakes and fragments thereof which did not show any distinctive signs of any specialised reduction strategy' (Baker 1996:20). Baker (1996:21-22) argues that evidence for specialised strategies associated with the manufacture of backed blades and heat treatment of silcrete is present. At Woods Gully, large-scale and intensive silcrete processing and backed blade production occurred, which differentiates this site from the others (Baker 1996). Sixty-six backed blades (including whole, broken and unfinished specimens) and manufacturing debitage was recovered from the broad area excavation of 4.25m².

Baker (1996:24-25) concludes that at Woods Gully camping occurred immediately adjacent to the creek, due to the lower relief and different faunal resources than at zones C3/F4. Revisitation is identified as the factor causing archaeological evidence to build up. No differences in the nature of evidence near or away from the creek is noted, apart from the heat treatment and intensive backed blade manufacturing area. Baker suggests that the evidence of intensive tool production indicates 'maintenance' behaviour, rather than the more widespread evidence of 'extractive' behaviour, indicated by the common elements of the toolkit. Baker argues that maintenance activities were restricted to Woods Gully, a location where Aboriginals invested time and energy in 'gearing up', as well as general foraging. Maintenance activities represent an investment in time preparing for hunting small bodied prey (such as migratory water birds) closer to Hexham Wetlands, as an insurance against the higher risk of failure.

Effenberger (1996:9) assessed the Black Hill 2 site as being of 'very low significance', meaning 'conservation need not be considered as a site management option'. Overall the Woods Gully site was assessed as being of 'scientific significance on a state level of archaeological research'. 'The landscape attributes, the presence of an intense stone tool workshop area and the presence of a substantial amount of in situ material remaining, all contribute to its high significance'. A series of recommendations were presented for the Woods Gully site, involving a combination of destruction and conservation.

The Mindaribba Local Aboriginal Land Council strenuously disputed the conclusions and recommendations of Effenberger and Baker (1996) in a series of meetings and discussions with the RTA and NPWS. The high Aboriginal value attached to the sites was expressed to all parties. Dissatisfaction with the archaeological report, significance assessment and management recommendations were also expressed. These events led the RTA to engage South East Archaeology to undertake an extensive salvage excavation of the areas to be impacted (Kuskie & Kamminga in prep.).
Analysis of results and report preparation are in progress (Kuskie & Kamminga in prep.) and only preliminary results can be presented here. A fourteen week fieldwork programme was undertaken in late 1996. At site 38-4-0376 (Black Hill 2 - RTA zones C3 and F4) 7 m$^2$ and 56 m$^2$ broad area trenches were excavated, along with 364 0.25 x 0.25 metre test units and several small hand excavations within grader scrapes. Four 'grader scrapes' across the site involved removal of the grass and upper five centimetres of deposit, ripping and inspection prior to and after application of high pressure water from a cart (Kuskie & Kamminga in prep.). Slightly more than 14,000 artefacts have been recorded. These comprise a range of artefact types (mostly associated with microblade technology) and the raw materials are predominantly silicified volcanic tuff and silcrete (Kuskie & Kamminga in prep.).

At site 38-4-0410 (RTA zone F5 - Woods Gully) an 87 m$^2$ broad area trench was excavated (including a 39 x 1 metre strip), along with 245 0.25 x 0.25 metre test units. Two grader scrapes were inspected, on the north and south sides of Woods Gully. Over 8,900 artefacts have been recorded. These comprise a similar range of artefact types (mostly associated with microblade technology) and the raw materials are predominantly silcrete and silicified volcanic tuff (Kuskie & Kamminga in prep.).

At both sites, evidence for activity areas are present in each excavation trench. A hearth was excavated from the Woods Gully broad area and radiocarbon dates will be obtained. Wide variations in artefact density from <100 to over 1200 artefacts per square metre (conflated) is apparent. Extreme variations are evident both within and between the sites, in respect of artefact densities and frequencies of artefact types and raw material classes.

The effectiveness of various methods and techniques of sub-surface investigation will also be assessed as a component of this project (Kuskie & Kamminga in prep.). Of particular note is that prior to the present road construction (which resulted in the exposure and recording of these sites in 1995), very little evidence was visible on the surface. Prior to this time a dense cover of grass limited surface visibility.

### 3.3 Holmwood Industrial Estate

Immediately north of the current study area, Curran (ERM Mitchell McCotter 1995a, 1996a) has investigated the Holmwood Industrial Estate. Curran (ERM Mitchell McCotter 1995a) surveyed the 60 hectare property bordering the New England Highway, John Renshaw Drive and Weakleys Drive. Six sites were located: BS1 (NPWS no. 38-4-386) an artefact scatter containing twelve silcrete and 'mudstone' artefacts; BS2 (NPWS no. 38-4-379 + 38-4-387) an artefact scatter containing up to 20 artefacts of 'cream, yellow and red fine-grained siliceous stone'; BS3 (38-4-388) a scatter of over 200 silcrete artefacts, within a 400 x 300 m area; BS4 (38-4-380 + 38-4-389) an artefact scatter of over 100 cream, yellow, red and white fine-grained silicous artefacts, mostly flaked pieces; Site BS5 (38-4-381 + 38-4-390) an artefact scatter on the upper slopes of an undulating hill with up to ten artefacts of cream, yellow and red fine-grained siliceous stone present; and Site BS6 (38-4-382 + 38-4-391) an artefact scatter with over ten cream and yellow fine-grained siliceous artefacts, within a 50 x 50 m area.

The artefact distribution along the drainage line was 'reasonably continuous where there was ground disturbance and surface exposures, thus indicating there was archaeological potential for high sub-surface densities'. A high degree of variability in artefact types, sizes and raw materials was noted and the artefact types were thought by Curran to be 'significantly different to those recorded in other open sites in the local area' (ERM Mitchell McCotter 1996a).
Curran (ERM Mitchell McCotter 1996a) undertook test excavations at four of the sites. A total of 78 test pits were excavated at 15 m intervals along six transects. The transects predominantly sampled the drainage line and slope landform units. 74 artefacts were recovered during the test excavations (predominantly silcrete, and to a lesser extent ‘mudstone’, flakes and flaked pieces). Curran interpreted this as evidence of low intensity occupation. However, Curran acknowledges that ‘the potential intensity of occupation may be obscured by the relatively low densities and inconsistent artefact distribution across the subject site’ (ERM Mitchell McCotter 1996a:1.3).

Photographs of silcrete boulders attached to the site records indicate a probable local source of silcrete in the form of gravels. These ‘siliceous pebbles’ were noted across the surface of upper slopes as ranging between 5 mm and 100 mm in size. Fresh fractures on the pebbles are attributed by Curran to exfoliation and disintegration, rather than Aboriginal use (ERM Mitchell McCotter 1996a). The stone is considered to be of a poor quality for Aboriginal use (ERM Mitchell McCotter 1996a:4.7).

3.4 Black Hill Sub-Division

Immediately south of the current study area, investigations of the thirteen hectare Black Hill rural-residential sub-division have been undertaken by Silcox and Ruig (1995). During the initial stages of construction of an access road (Walter Parade) and associated drainage works, the existence of an artefact scatter (Black Hill 1, NPWS no. 38-4-375) became known. The NPWS recommended that sub-surface testing be undertaken to assess the potential archaeological resource of the property, the remainder of which was heavily grassed.

Fieldwork was undertaken in December 1994 by Silcox and Ruig. The primary aims of the test excavation programme were to:

- ‘explore the extent and nature of the scatter of artefacts uncovered during the construction of the turning circle at the northern end of Walter Parade;

- investigate a number of locations on the main ridge and spur ridges which were suitable for camping and which did not appear to have been disturbed by previous or current European activities;

- determine whether archaeological deposit was present at these locations, to examine its likely nature and distribution across the ground surface, and to detect evidence of stoneworking events in the form of artefact concentrations which may provide viable samples for detailed analysis; and,

- determine whether any locations where archaeological material did occur had potential to warrant a more detailed salvage excavation’ (Silcox & Ruig 1995:3).

The property is similar to the current study area, comprising a ‘spur ridge’, from which simple slopes descend to the wetlands. Silcox and Ruig (1995:11) identified that the margins of Hexham Wetlands were likely to have been ‘favoured for habitation by Aboriginals because of its elevated and well-drained position and its proximity to two major resource zones - the wetlands and hinterland’.

Eleven transects (named TA - TK) of test pits were set out at seven locations (L1 - L7). 218 test pits were excavated. The total potential site area was estimated at 7.7 ha and a total area of 13.6 m² or 0.0177% of the potential site area, was excavated. Test units were dug at two
metre intervals along each transect, either in continuous series or in groups of pits separated by unexcavated stretches of ground, depending on the artefact density and the need to trace the distribution of artefacts. All test pits were 0.25 x 0.25 m in area and dug to the top of the B horizon at 0.23 - 0.35 m depth. Deposits were wet sieved using 2 and 5 mm mesh (Silcox & Ruig 1995:24-25).

663 artefacts were recovered from the 218 test pits. An additional 77 artefacts had previously been collected by the Awabakal LALC. The excavated sample comprised 51.7% 'indurated mudstone', 35.3% silcrete, 2.1% quartz, 1.8% acid volcanic, 1.8% fine grained basic, 1.2% chert, 1% quartzite and 5.1% of other raw materials. The sample included 190 whole flakes (105 'indurated mudstone', 63 silcrete), 291 broken flakes, 122 flaked pieces, 12 amorphous artefacts with retouch/useswear (6 flakes, 6 broken flakes), 9 cores (4 alternating platform, 1 unidirectional platform, 4 bipolar), 6 backed blades (4 complete, 2 fragments) and 26 pebble fragments and 7 other unspecified artefacts. 53.1% of artefacts were >10 mm in maximum dimension. Artefact density per square metre excavated averaged 48.7, and ranged from means of 3.2 to 293.3 for each transect. A volume of 3.507 m³ was excavated, with a mean artefact density of 190 per m³ (Silcox & Ruig 1995:32).

Silcox and Ruig (1995:36) summarise their results as follows: 'The test programme demonstrated that archaeological material was widespread on the ridge at BH1, and occurs in discrete concentrations of varying size and density separated by stretches of ground where much lower artefact numbers are present. It has shown where higher densities of artefacts, that may be associated with specific activity areas, are located, but it cannot conclusively establish that where low numbers of artefacts occurred that these areas were not on the perimeter of high density areas. However, where long continuous series of test pits have been dug and the low density is consistent, then this is taken as suggesting that, for the zone covered by the transect, the distribution pattern does consist of widely spaced discrete concentrations' (Silcox & Ruig 1995:36).

Silcox and Ruig (1995:38) predict that archaeological material is likely to be distributed in a 'discontinuous scatter of variable density, in a sub-surface context (the upper 30 cm of the A horizon soil) across the surfaces of the main ridge and at least two spur ridges'. Silcox and Ruig (1995) speculate that at locations L1, L2, L3 and L4 the evidence indicates possible higher artefact densities near the edge of the ridge crest (within 35 m), with lower densities on the ridge away from the edge, possibly due to the proximity to the wetlands and suitable surfaces for camping (Silcox & Ruig 1995:38-39).

Silcox and Ruig (1995:39-40) found evidence of heat treatment processes and alternating platform, multidirectional, unidirectional, RAS/tranchet and bipolar reduction strategies. The high percentage of artefacts <10mm (47%) was taken as evidence that stoneworking, possibly involving platform removal, backing or retouch, occurred on site.

The site was assessed as having scientific significance, due to its representativeness as one of only several large open sites on the margins of wetlands in the lower Hunter, apparent stratigraphic integrity, and the existence of a widespread, patterned and diverse artefact assemblage with research potential (Silcox & Ruig 1995:47). A conservation area of 50 x 50 m was recommended for L4 or L6, to encompass the exposed and potential artefact distribution and to allow for the investigation of spatial variability across the ridge surface.
3.5 Relevant Studies in Close Proximity to the Study Area

A small survey was undertaken immediately south of the current study area by Nightingale (ERM Mitchell McCotter 1996b), resulting in the location of site Black Hill 3 (NPWS no. 38-4-425) at grid reference 373100:6365820, within Lot 422 DP 791776, 21A Forsythe Parade, Black Hill. Eleven artefacts were located around the margins of a dam, within an area of 30 x 20 m. Artefacts included ‘mudstone’ flakes, flaked pieces and a retouched flake and silcrete cores, flakes and a flaked piece.

Bowdler and Happ (1982) surveyed a 330 kV electricity transmission line route between West Wallsend and Tomago, which since constructed, represents the main easement traversing the mid-section of the current study area. Conditions of surface visibility were low and no sites were identified within the current study area.

Kuskie (1992a, 1992b, 1993a) surveyed the route of Optus Communications’ fibre optic cable between Wyong and Coff's Harbour. The cable traverses the current study area within the main power easement (previously surveyed by Bowdler & Happ 1982) and across part of the main spur. Field survey was not undertaken in this locality because of the levels of existing ground disturbance, low surface visibility, the results of Bowdley and Happ’s study and the minimal impact of cable installation.

At Tarro, an artefact scatter (38-4-325), consisting of three artefacts, was located near the northern margin of Hexham Swamp, slightly over one kilometre east of the current study area. Dean-Jones recorded the site in 1992 as part of a survey for the proposed Anderson Drive interchange of the New England Highway. The site is situated within a disturbed context on a low bedrock spur, 50 m from the wetland. Dean-Jones (1992) observed that very few areas of elevated ground around the margins of the floodplains had been investigated archaeologically.

Glenn Atkinson, of the Soil Conservation Service, recorded an artefact site near the ‘Glenrowan’ homestead, on the northern margin of Hexham Swamp, several hundred metres east of the current study area. The site (NPWS no. 38-4-358) at grid reference 374000:6368300 consisted of numerous stone artefacts on the eroded face of an Early Holocene age foredune bordering Hexham Wetlands. Atkinson described the soil as being early or mid-Holocene in age.

3.6 Relevant Studies West and North-West of the Study Area

Several surveys have been undertaken within the low hills west and north-west of the current study area. Although the terrain is partly similar to the current study area, these locations are not adjacent to a major wetland.

One kilometre to the north-west of the current study area, Kuskie (1993b) surveyed Lot 23 DP 532814, Parish of Alnwick. Lot 23 is an 83.8 ha property bordered by Weakleys Drive and the New England Highway. Low undulating terrain, including broad low spurs, simple slopes and creek flats, are present. Scotch Dairy Creek and Weakleys Flat Creek traverse parts of the property. Despite general conditions of low surface visibility, a number of vehicle tracks enabled a reasonable sample to be obtained of the property. One isolated artefact was located on a low broad spur parallel to Weakleys Flat Creek. The results are interpreted as reflecting generally low intensity use of the property, with occupation focused on the margins of the Hexham and Woodberry wetlands, several kilometres distant.
Barber (Resource Planning 1992b) surveyed a 70 ha property at East Maitland. The property consists of low gradient simple slopes, located at the headwaters of Two Mile Creek. Barber located three isolated artefacts and an artefact scatter with four artefacts. All were situated in proximity to a watercourse and the artefacts were predominantly red silcrete broken flakes and flaked pieces. The artefacts appeared to be eroding from sub-surface deposits.

Dallas (1996) surveyed the Shamrock Hill Residue and Austin properties at East Maitland. The properties are located on either side of Four Mile Creek. Despite conditions of reasonable surface visibility, no sites were located.

Dean-Jones (1989a) investigated the 60 ha site of the Old Delta Colliery, adjacent to Mt Vincent Road near East Maitland, for a proposed waste disposal facility. Approximately half of the property consisted of the remains of the Delta Colliery, with the remainder being native vegetation. Low gradient simple slopes and minor intermittent watercourses were present. Five artefact scatters, containing between 2 and 22 artefacts, and one isolated artefact, were located. The sites occur along lower slopes or flats adjacent to watercourses, with the exception of one site on a ridge crest. Reddish brown 'silcrete' or silicified tuff was identified as the dominant raw material. In an addendum to the Old Delta Colliery report, Dean-Jones and Ruig (1992) describe an additional site, a native well. The well is situated within a sandstone outcrop and it is interpreted as being a place for the procurement of potable water after rain, in addition to other, unspecified purposes.

Ruig (1993a) surveyed a Telstra optical fibre cable route between East Maitland and the Benwerrin Exchange, on Black Hill Road, Benwerrin. The route follows a water pipeline, north of John Renshaw Drive. Two isolated artefacts were recorded along the ten kilometre route.

Ruig (1992) investigated proposed extensions to the Benwerrin Colliery, near Buttai. A 3.5 ha area on a sandstone ridge, adjacent to the western boundary of the existing mine pit was surveyed. No sites were located.

Nightingale (ERM Mitchell McCotter 1995b) surveyed a proposed haul route from Buttai Quarry. An artefact scatter comprised of three artefacts was located on a ridge crest.

Brayshaw (1985) located two artefact scatters close to Four Mile Creek, during a survey for the proposed Ironbank Colliery. The sites are located five kilometres west of the current study area, near the junction of John Renshaw Drive and Black Hill Road. Site 38-4-139 consisted of nineteen silcrete artefacts, adjacent to Four Mile Creek. Site 38-4-140 consisted of ten chert and silcrete artefacts, within a 70 x 4 m area, twenty metres from the creek.

Brayshaw (1994a) investigated the proposed extensions to the National Highway, from the F3 Freeway at West Wallsend to the New England Highway at Branxton. The route diverges from the F3 at Seahampton, and traverses the valley of Surveyors Creek and John Renshaw Drive, west of Buchanan. Five artefact scatters, five isolated artefacts and ten potential archaeological deposits (PAD's) were recorded along the 40.7 km route.

A number of surveys around Thornton, several kilometres north-west of the current study area, have revealed mostly small artefact scatter sites.

Curran (Resource Planning 1993a) investigated the 90 ha area of Lot 2 DP 243650, Thornton, for the proposed western portion of the Glenwood Industrial Estate. Lot 2 extends between the
New England Highway and Main Northern Railway at Four Mile Creek, west of Thornton. An artefact scatter with two artefacts was located.

Dagg (1996) surveyed Lot 1 DP 188036 and Lot 3 DP 554375 at Thornton, for proposed extensions to the Glenwood Industrial Estate. Three artefact scatters and one isolated artefact were recorded (each with <15 artefacts), in addition to a site previously identified by Stuart in 1995. Silcrete was the dominant raw material.

Curran (Resource Planning 1994) surveyed the 3 ha area of Lot 1742 DP 634868 and Part Lot 182 DP 792071 at Thornton, for proposed extensions to a clay extraction pit. An isolated artefact ("Nobby’s tuff" broken flake) and an artefact scatter with 25-30 silcrete and chert flaked pieces, flakes and cores were located.

A similar study for extensions to the O’Brien’s Quarry clay/shale extraction pit was undertaken by Curran (Resource Planning Pty Ltd 1993b) at Lot 1 DP 797295, at Thornton. No sites were located within the 41.5 ha property.

Brayshaw (1984a) surveyed Lots 461 and 462, DP 593438, Thornton, for a proposed rural-residential subdivision. The 50 ha property is located adjacent to the Thornton urban area. No sites were located, a result attributed to low intensity Aboriginal occupation of this property.

Dean-Jones (1986) recorded five artefact scatters near Thornton, as part of undergraduate University fieldwork in lowland areas of the Hunter Valley to assess the potential of the alluvial lowlands for archaeological sites.

Several kilometres to the south-west of the current study area, surveys have been undertaken for the Black Hill quarry. Greer and Brayshaw (1983) surveyed an area of 250 x 250 m, on the ridge crest adjacent to the former quarry. One site (NPWS no. 38-4-106) containing seven artefacts was located. More recently Ruig (1993b) investigated proposed extensions to the quarry. One isolated artefact was located within a 5.6 ha area, immediately north of the Black Hill peak.

3.7 Relevant Studies on the Southern Margin of Hexham Wetlands

Around the margins of Hexham Wetlands, a number of other studies have been undertaken, particularly on the southern fringe near Minmi. These are particularly relevant to the current investigation as the topographical contexts are often similar. However, conditions of low surface visibility have often limited the effectiveness of these surveys.

Brayshaw (1982) surveyed a property proposed for residential development, immediately west of Maryland, on the southern margin of Hexham Wetlands. Minmi Road and Hexham Wetlands form the boundaries of the property. Surface visibility was extremely low. An isolated artefact was located along a ridge, an artefact scatter with two artefacts in a sandy depression on the margin of the floodplain (38-4-87), and a large artefact scatter (38-4-86) around Flagggy Creek. Brayshaw (1982:5) estimated several hundred artefacts were present, mostly flakes and cores of a ‘fine grained siliceous’ material. Chert was also present. Some artefacts showed evidence of use-wear and flaking appears to have occurred on site.

Effenburger (1994) surveyed the Maryland Heights Estate, comprising Part Lot 802 DP 800581, City of Newcastle. The 15 ha property is located along Minmi Road, adjacent to Maryland. It comprises a ridge crest and slopes located less than one kilometre from the
southern margin of Hexham Swamp. No sites were located and Effenburger (1994) acknowledges low conditions of surface visibility.

Mills (1995) assessed the proposed residential sub-division of Fletcher, located south of Minmi Road, immediately west of Maryland. The area of approximately 77 ha lies 1.5 km from Hexham Swamp and contains a large ridge, side slopes and ephemeral watercourses. Mills (1995:3) acknowledges that the areas of high ground surrounding Hexham Swamp would have been used as camping areas because of their proximity to the food resources of the wetlands, vantage points, and their position above the damp and water-logged lower ground. No archaeological sites were located during the survey. Mills (1995:6-7) suggests various reasons for this result, including that larger camp sites were located closer to Hexham Swamp; visual contact with the swamp was absent; ground disturbance and low surface visibility.

Mills and Wilkinson (1994) surveyed the Minmi Road corridor and Landcom Development Site 12115, Precinct 99, at Maryland. Three artefact scatters and ten isolated artefacts were identified. Two sites (38-4-86 and 38-4-87) were relocated along Minmi Road and at Wentworth Creek. Site 38-4-87, which had previously been identified as a large artefact scatter by Brayshaw (1982), was not considered to be a site by Mills and Wilkinson (1994).

Mills (1996) investigated an 18.15 ha residential subdivision at Part Lot 33 DP 831881, Parish of Kabibah, County of Northumberland, immediately south-west of Wallsend. The property is located one kilometre south-west of Hexham Wetlands and contains a ridge crest (with views of Hexham Wetlands), steep slopes, gentle slopes and watercourses. Conditions of low surface visibility and high levels of ground disturbance were present. Only one isolated artefact was located.

Stuart (HLA-Envirosciences Pty Ltd 1995) investigated Lot 2 DP 844711 at Windy Hill near Minmi, immediately south of Minmi Road, for a proposed residential sub-division. Dense vegetation restricted surface visibility and no sites were located.

Dean-Jones (1989b) surveyed the proposed Summerhill Waste Disposal site, situated between Minmi and Maryland. The 350 ha property includes the former Wallsend Borehole 1 and 2 collieries, resulting in only 10% constituting the natural ground surface. It consists of steeply dissected ridgelines located two kilometres south of Hexham Wetlands. The ridge crests offer views across the wetlands. The property forms the steeper and more elevated section of a spur leading into the wetlands. Dean-Jones (1989b) noted the presence of pale grey-cream tufts and silicified tufts, 'with excellent flaking qualities', exposed in redistributed overburden and in deep rills. The natural pattern of outcrop is unknown, but Dean-Jones (1989b:npn) noted that any such outcrops would 'have provided the Aboriginal occupants with an abundant raw material source for flaked stone implements'. No sites were located, a result Dean-Jones (1989b) attributed to sedimentation along drainage lines caused by runoff from overburden stockpiles and low ground surface visibility.

Significantly, Dean-Jones (1989b) noted the diverse nature of Hexham Wetlands and its capacity to provide a long term, reliable supply of a variety of foods and plant raw materials for implements, at least through the latter Holocene. Dean-Jones (1989b:npn) observed the 'bedrock ridges extending into the swamp on its southern and eastern margins - those areas now occupied by Maryland, Wallsend, Shortland and Sandgate, had easy access to wetland resources, freshwater (in Minmi, Wentworth, Maryland and Ironbark Creeks), outcrops of good quality flaking stone, and the low gradients which characterize larger open campsites'. The relative paucity of recorded sites within these contexts is attributed to 'lack of site surveys,
a long history of European occupation, extensive ground surface disturbance and dense ground cover in both agricultural and bush land' (Dean-Jones 1989b: npn).

Brayshaw (1979) surveyed the revised route of the Natural Gas Pipeline between Mardi Dam and Kooragang Island. It is situated south of the current study area on the margins of Hexham Swamp. Site 38-4-70, described as a sparse scatter of flaked pieces of chert and silcrete, was located on the crest of a slightly eroding spur, above Blue Gum Creek. It is situated near the junction of Minmi and Stockrington Roads.

Bowdler and Gollan (1982) surveyed the routes of 330 kV power lines between Eraring and Newcastle and between Tomago and Newcastle. The route crossed the southern and eastern margin of Hexham Wetlands. Several grinding groove and artefact scatter sites were located south of the wetlands.

Dean-Jones (1989b) noted the existence of a large artefact scatter on a low ridge within the grounds of the Shortland Wetlands Centre. The raw material present is identified as ‘silicified tuff from the Lower Newcastle Coal Measures, which outcrop nearby’.


3.8 Relevant Studies Around Other Lower Hunter Wetlands

Relevant surveys and excavations have been undertaken around the margins of other wetlands (e.g. Woodberry Swamp) within the lower Hunter Valley.

Ruig (1995) surveyed 10.54 ha for the proposed Tenambit Wetlands Project. The property comprises Crown Reserve R89147, County of Northumberland, off Metford Road north of Metford. Most of the area comprises swamp land or floodplain of low elevation. Surface visibility was extremely low. Three isolated artefacts were located (two ‘mudstone’ flakes and one silcrete flake). Considering the conditions of low visibility and high potential for further sites, a programme of sub-surface testing was recommended.

Kuskie (1994a) surveyed Lot 1 DP 559519, Thornton, for a proposed residential development. The 228 ha property is located adjacent to the Thornton urban area, although 85 ha of State Environmental Planning Policy 14 (SEPP 14) Wetland No. 828 was excluded from the assessment. Lot 1 is partially similar to the current study area and consists of two broad low ridge spurs descending to the adjacent wetlands of Woodberry Swamp. Gradients of the ridge side-slopes and basal slopes are generally low (less than five degrees), except in the vicinity of several gullies. Several minor watercourses and gullies drain into the adjacent Woodberry Swamp. Landscape units present include low, broad ridge spurs, simple slopes, basal slopes, alluvial flats and wetlands. The underlying geology of the elevated landscape units consists of siltstone, sandstone and conglomerate of the Permian Mulbring Siltstone Formation. Lot 1 was used for pastoral purposes and therefore dominated by a dense cover of grass.

Despite conditions of low surface visibility, nine artefact scatters and one isolated artefact were located. The sites ranged in size from 2 to 32 artefacts at densities of up to 9.4 artefacts/m². Flaked pieces and flakes were the dominant artefact types and silcrete was the main raw material (83%). Kuskie (1994a:17) argued the entire landscape of Lot 1 was probably utilised
by Aboriginal people to differing extents and that the results of the survey were largely a function of conditions of surface visibility. Because the effectiveness of the survey was severely constrained by a dense cover of grass, a programme of further archaeological assessment was recommended.

Kuskie (1994b:1) undertook the sub-surface investigations recommended for Lot 1 DP 559519, at Thornton, in order to adequately assess the extent of the sites previously recorded (Kuskie 1994a), to determine whether the recorded sites contained sub-surface deposits of artefacts, to adequately assess the significance of each site and to effectively assess the majority of the study area in which low surface visibility had restricted the effectiveness of the initial survey. Fieldwork involved a series of transects being excavated at each site by a grader. Generally, two transects were excavated at each recorded site, either perpendicular to each other or perpendicular to the previously recorded surface scatter. The first scrape involved a grader removing the grass cover and top 0-5 cm of soil. The soil was graded to one side and each transect inspected on foot. At 10 m intervals along each first scrape, two 10 litre buckets of soil were sieved using 5 mm mesh. Any artefacts located along the transect or the spoil heap were recorded and collected. After inspection of the initial scrapes was completed, the grader was recalled to conduct a second scrape along the same transects. The process of inspection was repeated, however two buckets of soil were sieved every 3 m, in order to obtain a larger sample. The depths of the second transect varied, but the soil graded was generally between 5-20 cm deep, encompassing most of the A Horizon. Trenches measuring 3 x 1 m and up to 0.5 m deep were also excavated at each site, by use of a backhoe. Successive levels between 5-15 cm thick were excavated and four buckets of soil sieved through 2 mm mesh for each level (Kuskie 1994b).

The use of mechanically excavated trenches resulted in a larger, but less controlled sample, than would be available through other methods (such as trenches excavated by trowel or shovel). Hence, on one level an increased sample size may provide more reliable information about site contents. However, the decreased control is also likely to provide less reliable information about the spatial context of artefacts, both horizontally and vertically, than would other techniques. Several problems expected of such a gross-scale method were also encountered, including the inconsistency in depth and volume of each level excavated, infrequent clear separation of the A and B Horizons, and some mixing between spoil heaps resulting from their placement too close together or the activities of cattle (Kuskie 1994b:12-13).

Measures of artefact density were compared to assess variations in site contents and compared with environmental variables to refine a predictive model of site location and to allow for more substantive predictive statements concerning the likely numbers and types of artefacts in the unsurveyed portion of the study area. Comparisons of artefact and raw material frequencies were made between the sites (Kuskie 1994b:13).

A total of forty-six transects were excavated, comprising twenty-three initial grader scrapes and a second, deeper scrape at each location. This resulted in a total effective coverage of 11,716 m², for forty-six transects, or approximately 0.5% of the 228 ha property. This equates to 0.8% of the 143 ha study area, excluding the wetlands zone. Using the effective coverage of 5,492 m² for the twenty-three initial grader scrapes, approximately 0.38% of the 143 ha area was inspected, excluding the wetlands zone. Fourteen backhoe trenches were excavated, one at each site, to a total area of 42.9 m², an average of 3 m² each. A total of 21.57 m³ of soil was sieved from the grader scrapes and backhoe trenches. The duplex soil (generally a 10-40 cm deep sandy silt A horizon overlying a silty clay or clay B horizon) was considered to relatively stable geomorphologically, but affected by land use practices in historical times.
A total of twelve artefact scatters were recorded in Lot 1, representing an increase in two sites from the initial survey (Kuskie 1994a) and the upgrading of Isolated Artefact 8 to site status. A total of 1234 artefacts were recorded in the sample, comprising 1026 artefacts from the sieves and 208 artefacts from the surface of transects (Kuskie 1994b:24-25).

Artefacts were located in every initial and second grade scrape, with the exception of only 5 out of 46 transects. Artefact densities exhibited a wide range of variation between transects. The results indicated artefacts are likely to occur in a sub-surface context across the entire elevated portion of Lot 1, at varying densities. Artefact densities varied from 0.11 to 4.5 artefacts/100 m², with a mean of 1.77 artefacts/100 m². Volume densities varied from 5.36 to 139.84 artefacts/m³, with a mean of 47.57 artefacts/m³. There is a general correlation between artefact densities per unit of area (derived from the surface area inspected and the number of artefacts recorded on the surface) and artefact densities per unit of volume (derived from the volume sieved and the number of artefacts located in the sieves) (Kuskie 1994b).

In several backhoe trenches artefacts were located in the B Horizon. These results were considered to be anomalous for the following reasons: a) the artefact types are comparable to the assemblages in the A Horizon; b) the depths from which deposit was taken were estimates only and may not be accurate; c) the depth of the transition from the A Horizon to the B Horizon was often unclear; d) soil from the A Horizon may have been inadvertently excavated with the B Horizon, resulting from the gross scale of the excavation methods used; and e) artefacts may have moved into the B Horizon through treadage, or by falling through cracks in the soil or down animal burrows (Kuskie 1994b:27).

The dominant artefact types were flaked pieces (34.6%) and flakes (27.6%), followed by chips, cores, broken flakes, blades and broken blades. Evidence exists for the production of microblades and heat treatment of silcrete. Silcrete is by far the most common raw material within each site and the study area as a whole. The only notable internal variation is that sites 8 and 9 are comprised almost entirely of silcrete, to the exclusion of other raw materials. This is indicative of the different activities (procurement and reduction) which have occurred in this location. Within the study area, localised occurrences of silcrete gravel were observed at sites 7 and 9, and elsewhere on the surface. A variety of colours were recorded, including red, pink, cream and grey. No one colour was dominant and the frequencies vary between sites. A low frequency of 'indurated mudstone' (sili¢ified tuft) and very low numbers of quartz, chert, other sedimentary and volcanics are present. The assemblages were interpreted as representing evidence of repeated occupation by small groups of people. A localised source of silcrete gravel at site 9 appears to have been exploited by the Aboriginal inhabitants (Kuskie 1994b).

The identification in the excavated sample of a virtual continual distribution of artefacts across the study area, at varying densities, lead to consideration of whether artefact densities varied in relation to particular environmental attributes. A trend was identified for artefact density on the simple slopes and basal slopes to be greater than on the ridge crests. It was also demonstrated that higher artefact densities tended to occur closer to the wetlands. The major exception is between 901-1000 m distance, which includes transects 9B and BH9. These transects were located at an occurrence of silcrete gravel, which appears to have been exploited as a source of material for use in manufacturing artefacts. Hence, if these transects are excluded from the data, there is a clear trend for artefact density to increase closer to the wetlands. This supports predictions that the wetlands were a major focus of activity in the locality and that more abundant evidence for occupation and land use is likely to be located around the margins of the wetlands. Comparisons of artefact density with elevation were also undertaken, because it may provide indirect evidence of the relationship between intensity of
land use and the wetlands (which are at the lowest elevation). While the study area is all lower than 25 m a.s.l., the ridges tend to have the highest elevations, while the simple slopes and basal slopes around the margins of the wetlands are lower. There is a tentative trend towards increased artefact density at lower elevations (Kuskie 1994b).

Most of the slopes sampled are in closer proximity to the wetlands than the ridges are. Lower artefact densities were observed in the classes of highest slope (0-10° and >2-10°), however the sample is small and no clear trends are present. Several sources of fresh water are available in Lot 1, the major one being the wetlands and no site is further than 300 m from a potential source. A lower artefact density occurs in transects further than 200 m from a fresh water source, but the sample is relatively small.

The sites are of high significance to the local Aboriginal community. Site 9 was assessed as being of moderate archaeological significance within a local context and the remaining eleven sites of low significance, a rating which had been reduced because of their low level of integrity. Recommendations were presented to conserve a representative sample of sites 6 and 9. Application for Consent to Destroy was recommended for the remaining relics, in consultation with the Mindaribba LALC and in view of the Land Council’s wishes for possible further salvage (Kuskie 1994b).

Near Maitland several studies in close proximity to the Hunter River have identified artefact scatter sites. Brayshaw (1984b) surveyed a 120 ha property adjacent to the Hunter River at Bolwarra Heights, three kilometres north of Maitland. The property comprises undulating terrain (primarily simple slopes) covered by pasture grass. One artefact scatter containing 40 artefacts was recorded. Brayshaw (1995) resurveyed an 86 ha part of the property in 1995. Conditions of surface visibility were higher and two new artefact scatters were recorded. Recommendations were presented for sub-surface testing which has subsequently been undertaken by Baker (1996 pers. comm.). Baker (1996 pers. comm.) has confirmed that sources of the raw material silcrete are present within the property.

3.9 Overview

From this summary of relevant archaeological studies within the lower Hunter Valley, the common site types and site contents, typical site locations and primary archaeological research themes become evident.

Most sites within the lower Hunter (excluding the immediate coastline) are artefact scatters, typically containing less than five artefacts, occurring at a low density and situated within close proximity to drainage lines. Other site types have been located in the lower Hunter Valley, including axe-grinding grooves, middens, bora/ceremonial sites, burials, scarred trees, stone arrangements, rockshelters with art, fishtraps and places of historical or traditional Aboriginal significance.

Dean-Jones noted eight years ago that it was unexpected that more sites had not been found adjacent to the wetlands along the margin of the Hunter River floodplain, considering their high resource value (Dean-Jones 1989a). She proposed that low ground surface visibility may have been a contributing factor. However, the results may have also been a function of limited survey work having been undertaken along the wetland margins. Silcox and Ruig (1995:8) suggested sediment deposition and bioturbation may have also been factors.

Dean-Jones (1989a) stated that based on the archaeological evidence available in 1989, the focus of Aboriginal occupation appeared to have been along the stream tributaries leading to
the wetlands. However, in recent years, with the discovery of substantial artefact scatters on the margins of the wetlands (Effenberger & Baker 1996, Kuskie 1994a, 1994b, Kuskie & Kamminga in prep., Silcox & Ruig 1995), there is a growing body of evidence supporting the theory that occupation was also focused along the margins of the wetlands.

Predictive models of site location have varied as knowledge of the archaeology of the lower Hunter Valley has expanded. Artefact scatters are generally predicted to occur close to watercourses (cf. Dean-Jones 1989a, Effenberger 1995, Kuskie 1993b, Resource Planning 1992a), but also on level elevated locations such as ridge crests and spur crests (cf. Baker 1996, Brayshaw 1994a, Effenberger 1995, Kuskie 1992a). Studies around the margins of wetlands have begun to reveal evidence of focused occupation on landscape units such as wetland bordering simple slopes and basal slopes (cf. Kuskie 1994a, b). In fact, some studies argue that artefacts tend to be distributed in a virtual continuum across the landscape (e.g. over all elevated units adjacent to wetlands) (cf. Kuskie 1994b, Silcox & Ruig 1995). The results of studies at Thornton (Kuskie 1994b) and Black Hill (Silcox & Ruig 1995) indicate that within an environmental context comparable to the current study area, artefacts may occur in a virtual continuum, but at a relatively low mean density. Densities are likely to vary extensively depending upon the nature of the activities and the location of repeated activities. Relatively higher artefact densities are expected to occur in association with knapping events or frequently visited areas, and a low density ‘background’ scatter could be expected where focused activity has not occurred (Kuskie 1994b, Silcox & Ruig 1995).

Earlier models of occupation in the region have focused on a dichotomy between the coastal and hinterland zone and the seasonal availability of resources. For example, Brayshaw (1986b:6) noted the comparative lack of sites in the hinterland as compared to the coastal zone, and suggested ethnological evidence supports the contention that occupation was focused on the coastal plain and lake margins, with ‘forays into the rugged hinterland, notably in winter, for the performance of rituals, exchange in goods and hunting kangaroos’. Similarly, Vinnicombe (1980) postulated a seasonal model of exploitation, in which shellfish gathering and fishing was best in the summer, and terrestrial animals were more easily caught in winter. Therefore in summer people congregated along the coast when marine foods were abundant and went inland in winter to participate in ritual kangaroo hunts (Vinnicombe 1980).

In a local context, a similar model of occupation has been proposed for the late Holocene period around the Hexham Wetlands. Effenberger (1996:18) speculates that Aboriginal occupation of the swamp margins may have been seasonal, with occupation focused on spring to late summer when swamp resources were most abundant and ‘other coastal and inland areas were stressed due to drought’. In autumn and winter the Aborigines ‘would have moved to rock shelters and higher ground of the hills where their subsistence would have consisted of forest species’ (Effenberger 1996:18). Further evidence is required to adequately assess these models of occupation.


Aboriginal occupation within the Central Lowlands of the Hunter Valley commenced at least twenty thousand years ago. Koettig (1987) obtained a date of >20,200 BP from a hearth at Glennies Creek, thirty-five kilometres north of Branxton. In surrounding regions, Aboriginal occupation has been dated to at least 19,000 years ago on the Liverpool Plains (Gorecki et al 1984), 11,000 years ago in the upper Mangrove Creek catchment of the Hawkesbury River (Attenbrow 1987) and 17,000 years ago at Moffats Swamp near Raymond Terrace (Baker 1994). However, the majority of dated archaeological sites in the Hunter Valley are less than four thousand years of age (Brayshaw 1994b:15).
4. ABORIGINAL CULTURE

4.1 Group Identity and Boundaries

Traditional Aboriginal culture in south-eastern Australia was complex and varied. The present state of knowledge is based partially on studies of contemporary Aboriginal communities in northern and central Australia and on observations of the south-eastern communities after the immense disruption caused by European settlement (Thompson 1985).

Peterson (1976) describes Aboriginal society as being comprised of a hierarchy of organisational levels and groups, with fluid boundaries between them. The smallest group in the hierarchy are ‘families’; a man with one or more wives, their children and frequently some of their parents. The second level are bands; small groups consisting of members of several nuclear families, who perform the normal hunting and gathering tasks together for most of the year (Peterson 1976). At the next level are regional networks consisting of a number of bands. Members of these regional networks usually share beliefs in a common ancestor and/or have a common language dialect. Network members assemble for specific ceremonies, when the subsistence resources of a locality are plentiful enough to support a large number of people over a period of time. The ‘tribe’ is at a higher level in the organisational hierarchy. ‘Tribes’ are generally recognised as a linguistic unit with flexible territorial boundaries. At the broadest level of social organisation, or the pinnacle of the hierarchy, is the ‘cultural area’. All groups within a ‘cultural area’ share cultural characteristics, such as a common initiation ceremony, and speak closely related languages (Peterson 1976).

The nature of organisation of Aboriginal groups within the lower Hunter Valley is unclear, due to the limited ethnological records and the immense disruption to traditional culture that had already occurred by the time these observations were made. Earlier observers used the term ‘tribe’ to refer to anything from ten to five hundred people. Aborigines themselves used a variety of names which might have referred to dialects, territories of other groups, local bands or regional networks (Brayshaw 1986b).

The study area lies within the territory of the Awabakal ‘tribe’, as defined by Tindale (1974). Tindale (1974) describes the territory of the Awabakal as being an area of 1800 km² extending south from the Hunter River to Norah Head and Wyong, and west to Kurri Kurri and Maitland. To the west and south of the Awabakal, lay the tribal territory of the Darkinjung. It is described as a 4,700 km² area extending south of the watershed of the Hunter River, from well south of Jerry’s Plains extending east toward Wollombi and Cessnock; at Putty, and ranging over portions of the Macdonald and Colo Rivers. The Worimi tribe occupied a 3,900 km² territory north from the Hunter River between Maitland and Stockton, north to Forster and inland to near Gresford and Glendon Brook, Dungog. The Geawegal tribe is located from the northern tributaries of the Hunter River to Murrurundi, at Muswellbrook, Aberdeen, Scene and Mount Royal Range. They are affiliated with the Worimi and occupied an area of 3,900 km² (Tindale 1974). The Wonnarua occupied territory in the Upper Hunter River from a few miles above Maitland west to the Dividing Range and south to the Darkinjung on the divide north of Wollombi. They occupied an area of 5,200 km² (Tindale 1974).

Conflicting descriptions of tribal names and boundaries are presented by other authors. Professor S. A. Wurm (in Gunson 1974:30) argues that ‘Awabakal’ was probably a clan (or ‘regional network’) name, not a tribal name, because that is what the suffix ‘-gal’ or ‘-kal’ usually meant. However, it is also possible that the name applied to the largest clan (or ‘regional network’) of a tribe in the Lake Macquarie region, which became the name by which the tribe was subsequently known (Wurm in Gunson 1974:30).
Threlkeld (Wurm in Gunson 1974:30) defined the boundaries of the main Awabakal ‘tribe’ in 1828 as: from Reid’s Mistake (the entrance to Lake Macquarie) in the south, to Newcastle and Hunter’s River in the north, in the west by the Five Islands ten miles west of his mission (Gunson 1974:271). At this time he referred to the Awabakal as ‘Old Jackey’s Tribe’ and defined a tribe as being all the persons ‘related to him by birth or marriage’ who ‘congregate together as one family for defence, assistance, etc’. The neighbouring tribes were called the ‘Tuggerer Beech Tribe’ and the ‘tribe on the opposite shore’.

Official returns for Newcastle and Lake Macquarie in 1833 show a division of the Awabakal ‘tribe’ into four or five clans (which may in fact be bands or regional networks): the Lake Macquarie ‘tribe’ (Awabakal) had Biraban (John McGill) as chief; the Pambalong ‘tribe’ had Gorman/Colman as chief; the ‘Ash Island Tribe’ had Wallungull as chief; and the Kurungbong (Cooranbong) ‘tribe’ had Ben as chief. In 1836 and 1840 Threlkeld referred to the Awabakal as ‘King Ben’s tribe’. In 1836 he listed Cobbera’s Tribe or the ‘Sugar Loaf’ tribe which frequented Mount Sugar Loaf, Lake Macquarie, the Swamps and surrounding neighbourhood. This ‘Sugar Loaf’ tribe may have been a ‘tribe’ called Pambalong in 1833, and was apparently a clan (or regional network) of the Awabakal (Wurm in Gunson 1974:30).

Gorman, described as chief of the ‘Pambalong tribe’ in 1833, was probably the same person as Bo-win-bah in 1828 and Kua-mun (Colman) in 1836. Born around 1800, his wife’s name was Nanny or Wil-le-kah, but there were no children (Gunson 1974:316). Biraban, or John McGill, born around 1800, was a ‘chief’ of the ‘Lake Macquarie tribe’ and Threlkeld’s principal assistant. He spent his early years as an officer’s servant in Sydney. Biraban was married to Patty or Ti-pah-mah-ah with a son Francis or Ye-row-wa, born around 1823. His own name was We-pohing and presumably did not take the name Biraban until fully initiated. He does not appear to have had the same tribal status as King Ben (Gunson 1974:317).

From J. Warner’s Return of Natives at Lake Macquarie, 1833, the following people are listed as belong to the Swamps country or ‘Pambalong tribe’: Women including Old Mary, Mungay, Young Kitty, Bowyere, Nanny Boyce, Mune, Mollbirrong, Dingeing, Cumbaray, Maria, Birraway, Kitty Pucker, Cangallynoorbanda and Peggy; Girls including Bandicootee, Sally, Pitty, Pullare, Kitty Warrow and Susan; Men including Gorman (chief), Coleman (chief), Long Jack, Old Wallabie Joe, Old Mick, Cockey, Wallabie Joe 2nd, Jack, Old Morang, Boatswain, Barbary, Pussey, Old Barraway, Old Bungaree 2nd, Harry Moor 1st, Harry Moor 2nd, Pussell, Jimmy, Bruder, Tom, and Boollowooloo; Boys including Tom, Yong Billy, Buring, Little Pinkin and Young Tommy (Gunson 1974:362-4).

Threlkeld was conscious of differences between the Awabakal and Worimi (Gunson 1974:4). The Awabakal spoke the Awabakal language, recorded in detail by Threlkeld. The neighbouring Wanaru language was similar and possibly also related to that spoken by the Darkinjung (Gunson 1974:4). Gunson (1974) suggests linguistic evidence indicates the Awabakal may have had most in common with the Wonaah and also associated frequently with the Worimi.

Threlkeld observed that the ‘tribe’ at his mission was localised to the area between Newcastle and Lake Macquarie. However, most ‘tribes’ in the Hunter River-Port Stephens area visited the mission according to Gunson (1974). William Walker commented on the smallness of the ‘tribes’ in 1821: ‘That which is called a tribe probably never meets in one place once in six months . . . some tribes are so small that the aggregate is not more than ten . . . a whole tribe having perhaps never been seen together. They are generally divided into groups of 60 or 70; the largest company Mr Harper met with was about 200’ (Threlkeld in Gunson 1974:60).
The Pambalong territory is described as extending from the south bank of the Hunter River, west to Tarro and the foothills of the Sugarloaf Range, and south to Lake Macquarie and east to Newcastle West. Newcastle was probably also within their territory (Hartley 1990). This identifies the Pambalong clan or regional network as occupying the current study area. An account in the Wallsend & Plattsburg Sun (10/12/1890) based on the recollections of early settlers described the local ‘Aboriginals of the Big Swamp’ as occupying the country from Tarro to near Newcastle (Newcastle itself being the territory of the ‘Stockton blacks’), the Hunter River and the Lake being the other boundaries. The Lake Macquarie Aboriginals were recognised as being a separate ‘tribe’.

In a reply to the circular issued by the NSW Select Committee on the Condition of the Aborigines (NSW Legislative Council 1846) Reverend Bolton, Minister of the Church of England at Hexham, described the Hexham tribe as belonging to the swamps and visited places named ‘Guacumba’ and ‘Tirto’. Their chief is noted as being sub-ordinate to the ‘Newcastle tribe’, of which they formed part of. Reverend Bolton observed that they visit Maitland but do not venture further west (NSW Legislative Council 1846).

What these accounts indicate is that the identification of the names and boundaries of tribal groups, regional networks and bands within the lower Hunter region is unclear and may never be resolved. The changes wrought on Aboriginal society by the time of the first ethnohistorical observations and the lack of anthropological expertise of the recorders, has limited the usefulness of this data. Peterson’s advice about the fluid nature of Aboriginal group boundaries is also pertinent. Applying Peterson’s model, it can be speculated that a number of bands within the Lower Hunter formed different regional networks, which in turn formed several broader tribal groups. On the basis of available data, the original names and territories of the various groups within this hierarchical structure is unclear.

4.2 Subsistence Resources

As discussed in Section 2.5, a wide variety of subsistence resources were available to the local Aboriginal population, from the open forest and wetlands. Several ethnohistorical observations have been recorded of the use of plants and animals in the lower Hunter region. While these observations have tended to focus on visible activities, they have often omitted details of less visible (and predominantly female) plant gathering activities (Brayshaw 1986b).

Threlkeld (in Gunson 1974:55) observed people eating cobra (‘large maggots from grass tree stumps’), wild plum, lizards, goanna, snakes, cockles (‘purramai’ - Threlkeld 1834:55) on Lake Macquarie where they could be obtained year round, whales which were eaten when found stranded on beaches, craw-fish, kangaroo, swans, pigeons, geese, wild ducks, and fish. Bandicoot were hunted and killed using waddies, with ‘high grassy bushy places’ first beaten to make them appear (Threlkeld in Gunson 1974:54). Fish were cooked, occasionally in fires kept alight on earth in canoes when fishing. Threlkeld (in Gunson 1974:190) observed various methods of obtaining sea food:

‘Their mode of fishing is curious, sometimes angling with hook and line thrown by the hand as they are seated in the bark canoe, sometimes diving for shell fish, sometimes standing in their frail bark darting their spears into the fish as they pass, or at other times using hand nets forming a circle in shallow waters and enclosing the fish, but the most curious method is that of planting sprigs of bushes in a zig-zag form across the streams leaving an interval at the point of every angle where the men stand with their nets to catch what others frighten together them by splashing in water’.
Lycett describes the getting of sand mullet and mud oysters ('mokoi' - Threlkeld 1834:54) (Sokoloff 1978a). Generalised accounts in a series of articles in the *Wallsend & Plattsburg Sun* in 1890 and 1891, based on recollections of early settlers, report possum, wallaby, kangaroo rat, snakes, lizards, goanna and eels as having been consumed (*Wallsend & Plattsburg Sun* 24/12/1890). Grant (1803:161-162, 173) observed the consumption of mussel shells on the lower Hunter and 'cabra' (shipworm *Teredo nautilis*, which is actually a bivalve mollusc). Dawson (1830:119) describes the use of fire to trap a group of kangaroos, which when they are enclosed in a nook or bend in the river or some other obstacle, are then killed.

Special mention is made in the ethnohistorical literature about the dependence of estuarine dwelling Aboriginals on 'fem roots', which is presumably bracken fern (*Pteridium esculentum*) but possibly also bulbs and roots of swamp and marsh plants (Moore 1981). Barrallier (1802:81-83 in Brayshaw 1986b) witnessed a young Aboriginal looking for the roots of 'Fern' in June 1801. Threlkeld (in Gunson 1974:55) observed people eating the fern root which 'they roast, and beat it with a stone upon a larger one, when they use it for bread'. Brayshaw (1986b) considers this fern may have been *Blechnum* spp. (swamp fern). Ebsworth (1826:71 in Brayshaw 1986b) also documents its consumption at Dungog, where it was known as 'bungwall'.

An account in the *Wallsend & Plattsburg Sun* (3/1/1891) based on the recollections of early settlers, states that grinding 'between flat stones was done of one particular reed (name forgotten) and certain roots'. Fern roots were crushed, but it is unknown if the cake was baked or eaten raw (*Wallsend & Plattsburg Sun* 3/1/1891). Threlkeld (1834:48) reports that the Aboriginal name for the site of Newcastle, 'Mulubinba', came from an indigenous 'fern' named 'mulubin'. Bracken fern has thin, starchy rhizomes which are edible from late summer to autumn (Isaacs 1987:105). The rhizomes are sometimes pounded to extract the starch, which is cooked in cakes, as the rhizomes alone are very fibrous (Isaacs 1987:105).

Backhouse (1843:380) records from his and G. W. Walker's Aboriginal guides that the Aborigines had ceased to use the fern root, but they roasted and ate the flower stems of the gigantic-lily (*Doryanthus excelsa*). The roots of this plant were also eaten by being roasted and pounded into a sort of cake. This is similar to *Macrozamia* spp., but the macrozamia nuts are soaked for two to three weeks (Backhouse 1843:380).

Threlkeld (in Gunson 1974:55) observed people eating macrozamia, which had to be prepared by a special process to remove toxins, involving soaking the seeds in a swamp for a week or two, then roasting. David (1890) also recorded the preparation of macrozamia fruit: "the gins used to gather it when ripe and put it to soak in nets made of fur of opossums. After allowing it to soak for three or four days in rain water, they would bruise it and bake it into cakes fifteen inches in diameter . . .

No references are made to seeds of kangaroo grass (*Themeda australis*) being ground, although their occurrence is widespread in the valley (Brayshaw 1986b). The seeds are normally ground and baked, and are available from December to March (Isaacs 1987:229).

### 4.3 Material Culture

The material culture of the local Aboriginal population would have included a range of items related to subsistence, cultural and social activities and shelter. Ethnohistorical observations of these items are discussed below. However, in the archaeological record, few of these items are preserved. Stone, bone and shell are the materials most frequently represented in archaeological sites.
Ensign Barrallier was one of the first to report on Aboriginal culture in the Hunter region. Barrallier (1802:83 in Brashay 1986b) described Aborigines navigating along the river in canoes, ‘Wumarus’ 3 feet 10 inches long, lances 18-22 feet long, fishing lines, and the remains of a fish net and weir on a creek at Newcastle. The use of canoes was also observed at Maitland by Mrs Ellen Bundock in 1826 (Brashay 1986b), Threlkeld (in Gunson 1974) and Grant (1803:173).

Reverend Threlkeld (in Gunson 1974:67) provides detail of the manufacture of fishing, hunting and fighting spears:

The fish spear (‘Kul-la-ra’ and ‘Mo-ting’) are made from the stem of the grass tree, at the end there are four pieces of hard wood, about two feet long, (which) are fastened with a bark thread covered with the grass tree gum, heated in the fire until at a melting point, when it is worked round the thread fastening it... The three or four shorter spears thus fastened to the long stem of the grass tree, of about six feet length, becomes thus somewhere nigh eight feet in the total length... Small wooden wedges are inserted betwixt the attached short spears just at their base where they are tied, and likewise gummed over firmly... The points of each skewer is hardened in the fire, by charring; and when hot, covering it with a coating of the grass tree gum, fastening at the same time a barb of bone at the point’. 

‘The hunting spear, ‘wa-rai’, is likewise made from the stem of the grass tree, but having only one hardened joint of wood inserted at the end, as already described. The battle spear is made of the same material, but often with the addition of pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw. The march of intellect directed the blacks, latterly, to use fragments of broken glass bottles instead of quartz, thus inflicting fearfully lacerated wounds... ’ (Threlkeld in Gunson 1974:67).

All spears are thrown by a throwing stick (‘wom-mur-rur’) generally four foot long by half an inch thick, tapering to a point at one end where a barb is fixed (Threlkeld in Gunson 1974:67). Threlkeld observed the trade of spears with populations further inland, in return for possum skin cloaks and ‘hanks of line, spun by hand from the fur of animals of the opossum tribe’ (Threlkeld in Gunson 1974:42, 61).

Threlkeld describes a variety of items including waddies, often made of ironbark wood (Ebsworth 1826:77 in Brashay 1986b); yamsticks, up to two metres long and four centimetres in diameter; fish hooks made of shell ground down on stone; wooden bowls cut from tree burls; water carriers of sheets of bark, tied at each end with a bent twig handle; oval wooden shields, three feet long by eighteen inches wide, painted with a white coloured earth resembling pipe-clay and crossed with two red bands or stripes; two forms of canoes made of bark from trees, one which measured 12-14 foot long by 3-4 foot wide; hand nets used for fishing; and fishing lines (Threlkeld in Gunson 1974:42, 54, 67, 190).

The convict artist R. Browne, illustrated in about 1813 a variety of implements, including four types of spears (four-pronged fish spear, plain and single-barbed hunting spears and a fighting spear with three wooden barbs), shields, clubs, a hafted axe with an iron blade, boomerang, palm leaf basket with handle, a water-carrier made from a tree gnarl, a twined dilly bag and a fishing line with shell hook (Gunson 1974).
Threlkeld (in Gunson 1974) observed bark stripped from trees to make canoes. The Awabakal used stringybark, white stringybark, thin-leaved stringybark or swamp mahogany for their canoes. Stringybark was favoured because of its pliant characteristics (Brayshaw 1986b). Dawson (1830) indicates that tea-tree bark was occasionally used to make small baskets.

Huts, or 'gunyers' were also made of bark. Threlkeld (in Gunson 1974:45) describes them at Lake Macquarie as 'mere erections of boughs of trees, or sheets of bark placed upright supported by stakes'. At Raymond Terrace they involved three sticks stuck in the ground and covered with bark (Caswell 1841 in Brayshaw 1986b) and at Port Stephens, Dawson (1830:171) describes them as 'supported by three forked sticks (about three feet long) brought together at the top in a triangular form: the two sides towards the wind are covered by long sheets of bark, the third is left open'. Dawson (1830:19-20) observed Aborigines removing bark, by cutting toe hold notches in the tree trunk for support, while stripping bark in lengths of one to two metres that were used as temporary sides and covers for huts. The incisions were made with a hatchet and spear-throwers were used to assist in peeling the bark.

While many items were made from wood, preservation conditions are generally limited so that evidence of these in an archaeological context is rare. Stone, bone and shell implements are common in archaeological sites. However, very few ethnohistorical references have been made to these materials.

Threlkeld (in Gunson 1974:67), as described above mentions the use of quartz flakes, and later broken glass, to form serrated edges along fighting spears. Barrallier (1802:81 in Brayshaw 1986b) also noted fighting spears with 'pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw'. Stone hatchets were observed by Threlkeld (1834, in Gunson 1974) and Dawson (1830). Dawson (1830:202) observed grooved heads with a handle fastened by adhesive gum. The stone was mainly basalt or diorite and ground at the edge. Hatchets were used to cut saplings for building gunyahs, for stripping bark from trees, cutting notches in trees for climbing, and cutting toe-holds in trees to procure animals or honey from bee nests (Mathews 1894).

Dawson (1830) states that there is evidence that shell scrapers were used to sharpen spears, but with the introduction of glass, that material quickly became preferred. Shells were used to sharpen or shape wooden implements or as fishhooks. Kangaroo bones were made into awls to sew kangaroo and possum skin cloaks, belts and headbands (Brayshaw 1986b).

However, apart from quartz spear barbs and stone hatchets, no mention is made in the ethnohistorical literature of other types of stone artefacts. None of the ethnohistorical accounts explain the profusion of Bondi points within archaeological sites, nor do they identify the large core and flake component as having been used within the historical period (Brayshaw 1986b:68). Brayshaw (1986b) suggests that this may be due to these items having escaped the attention of observers, or that they were not in use at the time of contact, having been replaced by shell, wood or bone. Dean-Jones (1990:68) suggests that it was because most observations were made from a distance and the stone tools were too small to be seen. For whatever reason, the manufacture or use of stone artefacts, which make up the majority of evidence in archaeological sites, is scantily documented.

In the late 1800's and early 1900's a number of locals were taking an interest in remains of the material culture, collecting and reporting on stone and wooden artefacts. McKierman (1911) reports that workers excavating a drain through a swamp, eight kilometres from Raymond Terrace, uncovered a woomera, two spear-heads and a shield. The 'whommerah' is described as being 39.75 inches long by 1 3/8 inches wide and made of 'headle wood' which does not
grow locally. The spears measure 22 inches in length and are made of ironbark. The shield is made of ironbark and measures 19.5 inches by 2.25 inches (McKieman 1911).

The surveyor Mathews (1894) exhibited a collection of artefacts from New South Wales to the Royal Society, including knives from the lower Hunter obtained by digging into the floors of rockshelters, and hatchets. Hatchet handles were described as being made from either a tough vine or part of a suitable sapling split longitudinally and placed in hot ashes. The hatchet head was secured by cord made from bark or sinews from the kangaroo’s tail. Gum was applied to the binding to keep it secure. The largest knives were interpreted as having been used ‘for skinning and dressing animals’.

In 1885 the Reverend Peter MacPherson (1885) exhibited a collection of artefacts before the Royal Society of NSW. The collection included a number of hatchets (two grooved) from the lower Hunter.

Thorpe (1928) describes an Australian Museum collection of implements from the Newcastle, Port Stephens and Lake Macquarie areas (first collected by D. F. Cooksey of Mayfield). ‘Primitive flaked celts’ were collected from Sandgate and are described as being made from ‘grey chert’. Various ‘chipped back’ and other flaked implements are described. Thorpe (1928:246) observes that near Merewether, ‘chert’ (silicified tuff) was abundant.

The ethnohistorical evidence reveals that a broad range of items were part of the local Aboriginal material culture. Other items not mentioned above but also likely to be present include message sticks, clapping sticks, bark and vine cords, netted and woven dilly bags, shell pendants and fur belts (cf Brayshaw 1986b).

4.4 Aspects of Society

Other aspects of Aboriginal behaviour and material culture were noted by the early settlers and explorers. Threlkeld (in Gunson 1974) described a burial, initiation ceremonies, cosmological beings and corroborees.

Dyall (1971) and Sokoloff (1978b, c, d) note the importance of fire. Fire was used to burn scrub in winter, which encouraged early growth of spring grasses to attract kangaroos and wallabies and cleared the ground for easier hunting (Dyall 1971). Fire was also used for cooking, warmth, in signalling between groups, initiation ceremonies, disposal of corpses, mourning, making weapons and canoes, fishing and hunting (Sokoloff 1978c). Aboriginal use of fire in the lower Hunter was first noted by Captain James Cook in May 1770: ‘We saw several smoaks a little way in the Country rise up from the flat land, by this I did suppose that there were Lagoons which afforded subsistence for the natives such as shellfish . . .’ (Cook in Sokoloff 1978b:314).

Threlkeld (in Gunson 1974:46) recorded a typical hunting expedition, one of many on which he accompanied the Awabakal:

‘At sun rise the whole tribe prepares for the hunt by taking their spears, throwing-sticks, hatchets and fire-brands, proceeding to the hills, they scatter themselves so as to surround a valley, leaving the entrance guarded by several good marksmen armed with spears. The surrounding party then begin to enclose shouting with all their might, but still in regular time. The kangaroos and other animals become alarmed and make towards the entrance of the valley, where a shower of spears transfix them
in their endeavour to escape... A fire is kindled on the spot and the animals are grilled ...

By Dawson's (1830:67) standards, Aboriginal women were treated poorly: 'They carry the wood for fires, make fishing nets and carry most other items when in transit. They make string out of bark. Items such as fish hooks made from oyster or pearl shells, broken shells, pieces of glass to scrape spears to a thin and sharp point, gum for glue and sometimes oysters and fish when moving from the coast to interior, are carried by the women'.

Dawson (1830:68) observed spears being thrown over distances of forty yards with accuracy and force. He saw birds killed by stones thrown by hand or by spears. Fish and animals were roasted on fire ashes and torn apart with teeth and fingers when cooked. People sleep 'before their fires' frequently in a circle, with covers of bark sheets in winter or rain.

Dawson (1830) referred to communication between Aborigines of the coast and interior in which European hatchets, shells and glass were exchanged for opossum skins, belts of yam and headbands. Grant (1803:156-7) met a 'bush native' 'who are considered as an inferior tribe by the inhabitants of the sea'.

4.5 Population

Early European settlers and visitors made several observations on the nature and size of the local Aboriginal population.

In the returns of Aborigines from selected blanket distributions, the following populations were recorded (Brayshaw 1986b:58, Threlkeld in Gunson 1974:360-361, Turner & Blyton 1995):

1821: Lake Macquarie area; over 100 people observed by Reverend Middleton;
1828: Lake Macquarie/Newcastle; 24 male adults, 26 female adults, 10 male and 4 female children;
1833: Lake Macquarie; 62 male adults, 38 female adults, 6 male and 11 female children;
1838: Lake Macquarie; 15 male adults, 8 female adults, 2 male and 1 female children;
1840: Lake Macquarie; 15 male adults, 7 female adults, 3 male and 1 female children.

In a reply to the circular issued by the NSW Select Committee on the Condition of the Aborigines (NSW Legislative Council 1846) the following populations were documented:

1846: Newcastle; 20 male adults, 5 female adults, 2 male and 2 female children (Rev. Wilton);
1846: Morpeth; 15 adult males, 5 adult females and 3 male children (Rev. Middleton);

A dramatic decline in Aboriginal numbers over the preceding ten year period was noted by Reverends Wilton, Middleton and Smith (NSW Legislative Council 1846).

Due to the probable effects of the first smallpox epidemic in 1789, it is unlikely that the Europeans ever gained an accurate understanding of traditional population sizes. What is clear, is that from the time of early settlement the number of Aborigines declined rapidly (cf Brayshaw 1986b, Hartley 1986:48, NSW Legislative Council 1846).
4.6 Relationship With Settlers

Observations have been recorded of encounters between Aborigines and the early settlers and on the relationship between these groups. A number of initial encounters were relatively friendly (cf. Needham 1981, NSW Legislative Council 1846, Threlkeld in Gunson 1974:44). These were often between Aboriginals and escaped convicts and timber getters, but also free settlers.

In September 1790, four convicts seized a small boat at Port Jackson and landed at Port Stephens, where they lived with Aborigines for five years (Goold 1981:4). Fifteen convicts seized the ‘Norfolk’ in 1800 and sailed north. Off Coal Harbour heavy gales forced them to Stockton where the vessel was wrecked. Six men chose to stay and joined a camp of Aboriginals on Throsby Creek, living for several months until three men chose to make their way back to Sydney. Assisted by Aboriginals, two reached Broken Bay where they were taken by Lieutenant Grant to Sydney (Goold 1981:7).

The Aborigines were used as guides and trackers (Hartley 1995). Bo-win-bah (Gorman, chief of the Pambalong) and Biraban (Johnny McGill) guided F. W. Ludwig Leichhardt from Ash Island to Minmi cattle station, on the first stage of Leichhardt’s journey north in 1842. The party travelled around the margins of Hexham Wetlands (Hartley 1995:90-91).

When Governor Macquarie visited Maitland on 15th November 1821 he found Bungaree, chief of the ‘Boan Native Tribe’, with his family and thirty other tribal members, waiting. Bungaree and his tribe entertained Macquarie’s party with a corroboree after dinner (Brayshaw 1986b).

However, serious conflict quickly arose over the mis-treatment of Aboriginal women by the settlers. Misunderstandings with pastoral settlers also became more common. Convicts were often brutal to the Aborigines (Dawson 1830, Gunson 1974:4-5). The behaviour of timber getters in cutting down trees (believed to house the souls of Aboriginals awaiting rebirth) and shooting fauna (totem animals to the local Aboriginals) were also causes of conflict (Needham 1981).

For example, in March 1799, while two vessels were loading cedar at the Hunter River, there was a fight with Aboriginal people who drove the Europeans away. The Aborigines ‘gathered in great numbers on the foreshore’ and were ‘greatly incensed’ at something these men had done. When one boat returned to Sydney the Governor sent an armed party to rescue the remaining men. The Aborigines indicated the men had walked overland towards Sydney, where they arrived some time later. The rescue party refused to believe this and attacked the Aborigines, wounding several (Goold 1981:6).

From the early 1800’s convicts continually escaped from Newcastle, with the aim of making their way overland to settlements on the Hawkesbury River. Escapees were reportedly attacked by Aboriginals. In 1804 John Hughes, John Coleman and Edward Mundy escaped. Two days later they were involved in conflict with Aboriginals who wounded Coleman and took their clothing and food (Goold 1981:12).

Cases of conflict are reported in the Hexham Wetlands area, the following one from the early/mid 1800’s:

‘The late Mrs (Henry) Styles was going to get the cows when she noticed a spear from behind a tree. She called to the black who was aiming it and, as she knew him by name (Jackley), asked him to come and get some flour and other eatables. He
followed her and, on arrival at the homestead, she got a sword that was in the house and gave Jacky a taste of it. He didn’t trouble her again’ (Hartley 1986:48).

From the 1830’s groups of Aborigines raided settlers’ properties and stole food and attacked people. Many offenders were captured and tried before the Supreme Court in Sydney. Some were acquitted and others were sentenced to death (Turner and Blyton 1995).

Opinions of the settlers varied, with some viewing the Aborigines as ‘savages . . . with no homes, no occupation beyond procuring food for the day, and think nothing of to-morrow . . . they resist labour’ and wander ‘from place to place as the game grows scarce’ (Davidson 1846:144-6). Some settlers regarded the Aborigines as a nuisance; shiftless, unpredictable, thieving, dirty and smelly (Wood 1972). However, other settlers viewed the Aborigines from a different perspective. Missionaries such as the Reverend Threlkeld sought to convert the Aborigines to Christianity. He was genuinely interested in and spent considerable time and effort observing and recording Aboriginal life.

4.7 Aboriginal History

The effects of the European arrival were disastrous for the local Aboriginal people. The observations of early settlers give pertinent insights into the main causes of this event.

The rapid spread of European diseases, which the Aboriginal population had not hitherto been exposed to or developed immunity to, was a major factor. Smallpox, typhoid, influenza, scarlet fever, measles, diphtheria, whooping cough and croup contributed to the deaths of many Aboriginal people (Wood 1972). Major smallpox epidemics occurred between April and May 1789 and again from 1829 to 1831 (Butlin 1983). The first epidemic was reported to have decimated half of the Aboriginal population between Botany Bay and the Hawkesbury (Butlin 1983).

Reverend Threlkeld noted in 1828 the effects of influenza and in 1837 the effects of measles, whooping cough and influenza (Turner & Blyton 1995). In a reply by various Ministers of the Church of England in the lower Hunter Valley, to a circular issued in 1846 by the NSW Select Committee on the Condition of the Aborigines requesting information on the state of the local Aborigines, responses highlighted the effects of diseases and a rapid recent decrease in the Aboriginal population. Reverend C. P. N. Wilton, Minister of the Church of England in Newcastle, reported smallpox and measles to be factors in the rapid decrease in the local population (by half in the previous ten years) (Wilton in NSW Legislative Council 1846). Reverend George Augustus Middleton, Minister of the Church of England at Morpeth, partially attributed the population decline to native pock and influenza (Middleton in NSW Legislative Council 1846).

Factors other than disease contributed to the rapid decimation of the Aboriginal population and traditional life, including the loss of traditional hunting grounds and a decrease in abundance of the game that populated them. Again, the Church of England Ministers highlighted this factor. Reverend Wilton observed that the ordinary means of subsistence for the Aboriginal people was greatly diminished: ‘Emu, kangaroo, wallibbi and opossum almost disappeared from their hunting grounds’, fish and ‘Kon-je-voi’ were the only abundant foods left’ (Wilton in NSW Legislative Council 1846). Reverend Middleton also observed that the ordinary means of subsistence were seriously diminished, due to clearance of bushes and draining of lagoons. No kangaroos were present, but rivers, lagoons and forests continued to supply some food (Middleton in NSW Legislative Council 1846).
Tuner and Blyton (1995) argue that the decline in hunting grounds was not a major factor in the population decline around Lake Macquarie, as vast areas were not occupied by the Europeans until after the 1850's. They argue that violence by non-Aboriginal men against Aboriginal women was a major cause of the decline in population. To an extent this may hold true for the Hexham Wetlands area. However, the rapid decrease in hunting grounds (as non-Aboriginal settlers developed pastures, villages and mines) and a reduction in the abundance of food sources as native animal and plant habitats were destroyed, is evidenced by ethnohistorical accounts as to the negative effects on the Aboriginal population. The theory that violence was a factor in population decline is also plausible. The violent offences perpetrated against Aboriginal women are reported by Threlkeld (Gunson 1974:49) and Dawson (1830). The effects of rape on Aboriginal women, include the transmission of diseases, some of which may have led to infertility, and the production of offspring of mixed Aboriginal and European blood that may have been very undesirable for the Aboriginal parent. Reverend Middleton reported that infanticide 'was common, with half caste males killed' (Middleton in NSW Legislative Council 1846). This may have been a factor in the rapid decline of the Aboriginal population.

The rapid deaths of many Aboriginal people through disease also acted to destroy the complex structure of their traditional society. Systems of kinship, marriage, order and subsistence were thrown into disarray.

By the 1840's, many of the remaining local Aborigines were dependent upon the settlers for old clothing, money and rations (Wilton in NSW Legislative Council 1846). Aboriginal people were employed by settlers as hewers of wood, drawers of water (Backhouse 1843:389), about the house, to run errands, or on farms to gather maize or burn off (NSW Legislative Council 1846).

The annual distribution of blankets conducted by the Government was ended in 1844, to the anger of the local Aborigines who could no longer obtain traditional possum skin cloaks due to the reduction in animal numbers and possible loss of knowledge and trading networks.

The destruction of their traditional society and the increasing reliance on the settlers led many Aboriginals into a life of alcohol abuse. Increased hostility among Aboriginal people resulted from these pressures on their society, the integration of groups which historically had hostile relationships, and the effects of alcohol (cf. Hartley 1995). Reports in the Hunter Valley Gazette (18/12/1841) and Maitland Mercury (1/4/1843) identified the mixing of tribes congregated around the urban areas of Maitland and Newcastle, and fighting resulting from alcohol abuse.

In the latter part of the Nineteenth Century there was growing concern in New South Wales about the plight of the Aborigines. The Aborigines Protection Association was formed and in 1881 a Protector of Aboriginals appointed. In 1883 the Government established a Board for the Protection of Aborigines to achieve a 'more systematic and enlightened treatment of Aborigines'. Rural stations were created so that Aborigines could remain on tribal territory. One station was established at Pelican Flat (Swansea) in 1887 (Turner & Blyton 1995).

By the 1940's people moved to Newcastle and Lake Macquarie to escape the oppression of the Aboriginal Protection Board and to find employment. 5,300 Aboriginal children were removed from their families between 1909 and 1967 and placed in institutions. Broken Hill Proprietary Limited (BHP) and the Department of Railways were the main sources of employment. Oral accounts suggest racism was less overt in the working class city of Newcastle (Turner & Blyton 1995). Aboriginal people outside of the missions lived in shanty settlements on the fringes of European communities or in tent villages alongside railway lines. Between 1900 and
1960 such communities were at Swansea, Catherine Hill Bay, Dora Creek, Toronto, Fennell Bay, Teralba, Cardiff, Eleebana, Wallsend and Waratah. Platt’s Estate at Waratah was the home to many Aboriginal families until urban development in the 1960’s. A Newcastle City Council inspection in 1954 noted 125 adults and 109 children (Turner & Blyton 1995).

A number of people were important in initiating a recovery for the Awabakal people, including Dorothy Wotherspoon, Victoria Mathews, Marie Griffiths, Robert Smith, William Smith, George Griffiths, Colleen Perry, Gwen Wright, Gloria Smith, Shirley Smith and their families. ‘Today the Lake Macquarie region has one of the most dynamic Aboriginal communities in New South Wales and has the sixth largest concentration of Aboriginal people in the state’ (Turner & Blyton 1995).

4.8 Ethnohistorical References to Aboriginal Sites

A number of references are contained in the local ethnohistorical literature to Aboriginal sites in the region. Mostly these are ceremonial sites or sites of spiritual significance documented by Reverend Threlkeld. Threlkeld had established his Ebenezer Mission on Lake Macquarie at the present site of Belmont in 1825, relocating it to Deranambah (Toronto) on the western side of the lake in 1829.

Threlkeld notes a number of important sites, including: ‘Kin-ti-ir-ra-bin’, a small volcano on the coast near Red Head; ‘Pór-ro-bung’, a mystic sacred ring (bora); ‘Yu-lung’, a ring in which a tooth evulsion ceremony occurs; another volcano up the Hunter River, ‘Ko-pur-ra-ba’, from where ‘Ko-pur-ra’, red ochre was obtained; ‘Pit-to-ba’, a place of pipe-clay (‘Pit-to’); ‘Ko-na-ko-na-ba’, a large mountain on the northern end of Lake Macquarie where yellow ochre (‘Ko-na-ko-na’) was obtained; ‘Pu-ri-bang-ba’, the Ants’ nest place, another location from which a yellow ochre known as ‘Pur-ro-bang’ was obtained; ‘Nir-ri-ti-ba’ island (Moon Island), where muttonbirds and their eggs were feasted on; ‘Nul-ka-nul-ka’, or hard stone, a vein/dyke of volcanic rock (silicified tuff) at Reid’s Mistake; a freshwater hole between Lake Macquarie and the Sugarloaf mountains named ‘Wau-wa-run’ that was said to be bottomless; and ‘Yi-ran-na-li’, a high cliff at Newcastle, where it is said that if a person speaks, stones will fall down on them (Threlkeld in Gunson 1974:63-65).

Threlkeld (in Gunson 1974:66) also noted that on a range of hills near Lake Macquarie were circular erections of stone, 5-6 feet in diameter and 2-3 feet high. M’Gill (Biraban) informed him that tradition was that Eagle-Hawks had brought the stones there.

More sites in the locality are documented within a series on the local Aborigines published in the Wallsend & Plattsburg Sun in 1890 and 1891. The accounts are based partly on information from early settlers, often recollections of forty to fifty years previous. The aim of the series was to generate public interest with the hope of revealing more information on the local Aboriginals ‘for the education and benefit of future generations’. In a prophetic statement the writer is aware of the rapid changes to the countryside and suggested that ‘the residents of today may hardly recognise the town and country in forty years hence’ (Wallsend & Plattsburg Sun 13/12/1890).

The ‘Great Corroboree Ground’ is described as being located on level ground, in the vicinity of a canal, between Nelson and John Streets at Wallsend (Wallsend & Plattsburg Sun 13/12/1890). The ‘Pambalang clan’ were reported to be visited every six months by neighbouring clans (Lake Macquarie, Sugarloaf, Ash Island) for corroborees lasting one week (Wallsend & Plattsburg Sun 13/12/1890). A site called ‘The Doghole’, near Minni, is reportedly where ‘marriages’ were celebrated. It is located ‘a couple of miles from Minni and
is at the head of the Big (Hexham) Swamp' (Wallsend & Platffsburg Sun 3/1/1891, 7/1/1891).
This corresponds to Stockrington, near Blue Gum Creek.

Hartley (1995:5) notes that 'The Knob', a rocky knoll in the southern portion of Hexham Wetlands, was of 'great spiritual significance to the Aborigines and part of the higher ground was used as a burial site'.
5. HISTORICAL CONTEXT

Brief discussion of the history of European settlement in the Black Hill locality is important for identifying potential activities which may have affected the land, and hence the survival and integrity of any Aboriginal sites, and the potential for archaeological sites containing evidence from the contact period.

The Hunter region was identified by Lieutenant John Shortland of HMS Reliance on 16th September 1797. Shortland observed ‘Nobby’s Head’ and the coal seams in the cliff face. The river was named ‘Coal River’, which was changed to the Hunter River in 1804 in honour of the Governor of New South Wales. Coal mining was one of the first industries, commencing in 1798 (Windross & Ralston 1897).

Free selecting of land commenced on a small scale on the Hunter River in 1821 or 1822 (Windross & Ralston 1897). After the penal settlement of Newcastle was transferred to Port Macquarie in 1823, Assistant Surveyor Henry Dangar was instructed to survey the Hunter Valley with the view to opening it to settlement (Hartley 1995).

In 1823 Governor Brisbane visited Newcastle. Construction had begun on the carriage road from Newcastle to Walls Plains (Maitland), which followed the route of present day Andersons Drive, north-east of the current study area. The surveyor Henry Dangar (1828) wrote that by November 1825, there were 372,141 acres appropriated to 792 persons, 132,164 acres allotted for church and schools, and 100,000 acres reserved for Government. By 1825 the earliest non-Aboriginal settlers were exporting over 200 tonnes of farm produce weekly (Windross & Ralston 1897:14). In 1827 the first return of stock taken in the Hunter River district revealed there were 25,540 horned cattle and 80,000 sheep (Hartley 1995). Wheat was successfully grown, beginning near Hexham, but later became unprofitable due to rust infestation (Hartley 1986). Lucerne grown for hay to feed Sydney horses became an important crop from 1835 (Hartley 1995). The combined population of the Hunter Valley and Port Stephens was 3,225 in 1828. In 1833, the Hunter and its tributaries held a population of 8,138 (including 4,700 convicts and 3,438 free settlers) (Hartley 1995). By 1859 Hexham was a thriving farming settlement and a half way coach stop between Newcastle and Maitland (Goold 1981). A railway line extending across Hexham Wetlands from Minmi to Hexham was approved by Council in 1854 and built shortly afterwards (Goold 1949). The population continued to grow with increasing coal mining activity and in 1881 a census records 8,986 people in Newcastle, 1,160 at Minmi and 1,059 at Wallsend (Hartley 1995).

The 1840’s was a challenging period for the settlers, with drought, crop failure and depression. Smaller settlers lived in homes built of slabs, with the gaps filled with mud putty. The homes were often of one room, divided by a hessian partition, with a pounded earth floor and roofed with bark or teatree branches. The people laboured hard, mustering and drafting cattle, cultivating a plot for their own consumption and growing cereal for sale. Orchards were planted and fruit was sold or bartered with other settlers when crops were abundant. Any spare butter, milk or cream was often sold (Hartley 1986).

Dawson (1830) recorded the early method of clearing vegetation: ‘The settler commences by chopping down the trees which are afterwards cut into logs which are stacked in piles for burning. Then the land is ploughed up between the stumps which are generally left from eighteen inches to two feet above the ground’. The stumps remained for many years before burning.
Bushrangers concerned the settlers and the dense scrub surrounding the swamp was frequently used as a hideout. In the mid 1830’s Barbara Beckett was robbed. One of the bandits was later caught at Bombalong (Bumalong) Point, a thickly wooded spur protruding into the swamps near Minmi. A cart load of clothing and personal effects was retrieved from the Bushranger’s camp (Hartley 1995:94).

Timber getting was an important industry from the initial European settlement and by 1815 had reached considerable proportions (Windross & Ralston 1897:17). From 1799 to 1801 many trips were made by traders to the Hunter River. Cedar was the primary objective (Goold 1981). In the 1820’s when Major Morisset ruled the settlement, cedar gangs were working seventy miles up the Hunter River. Thirty convicts were required to cut one hundred logs a month (Goold 1981).

In 1828 the current study area lay within the Parish of Athwic. Dangar (1828) described the unappropriated lands as being ‘of an inferior description, though affording some tolerable grass country, the possession of which should be an object to the landholders already in the parish’. On the north-western margin of Hexham Swamp, in the vicinity of the current study area, Portions 3, 4, 5 and 6 are marked. Portions 3, 4 and 5 were grants ordered by Governor General Sir Thomas Brisbane. Portion 3 of 2000 acres was granted to Edward Sparke on 29/11/1825; Portion 4 of 260 acres was granted to Henry Rea, a saddler living in East Maitland, on 27/5/1825; Portion 5 of 300 acres was granted to Henry Rea on 12/11/1825; and Portion 6 of 500 acres was granted to William Bradridge on 26/8/1824 (Dangar 1828).

Edward Sparke arrived in Sydney in 1824 from Devonshire, an experienced agriculturalist with capital. Their initial grant was 2000 acres at Hexham and Tarro, but eventually the Sparke family owned 30,000 acres of land in the Hunter River District. Their homestead (‘Woodlands’) was built on the river bank at Tarro north-east of the current study area, and the surrounding 300 acres was cultivated with wheat and maize (Goold 1951, Hartley 1995). John Sparkes acquired Portion 6 off William Bradridge and Portions 4 and 5 off Henry Rea in 1827. The northern section of John Sparke’s property formed Wyhabah Farm which was divided into small tenanted farmlets. This resulted in the growth of Wyhabah village, where many small farmers who later settled in the Black Hill - Buttai district made their first home (Hartley 1995). The village name varies as the area had previously been called ‘Way Harbour’, ‘Wyrhabour’, ‘Wywarbour’ and ‘Wyarrabah’ (Hartley 1986:21). It is unclear if Wyhabah village extended into the current study area. It was situated on the margin of the swamps ten miles south-east of Maitland, around the lower lands of the ‘spur’ rising to the hill behind (Black Hill) (Pollack et al 1981). Wyhabah may have been located on one of the spurs immediately south of the current study area.

The western portion of the current study area (part of Portion 12) appears to have been granted to Thomas Walker in 1839 and subsequently sold to Charles Thomas and James Price (Hartley 1986:73). Later, Portions 11 and 12 were sold to William George Laidley Esq., Mine Proprietor, after the Ironbark and Bloomfield collieries had become established. The Hexham Colliery on this property, described as being thickly covered with ironbark timber, was advertised for sale in 1858. Edward Turner had commenced coal mining in 1844. Shafts had also been sunk on the adjoining Wyhabah Farm (Hartley 1995). The mine was advertised as three workable seams of ‘fine coal’, five substantially built huts, a large store, blacksmith’s shop and a four stall stable with useful machinery (Maitland Mercury 27/3/1858).

The Lanaghan (later Lenaghan) family lived at Wyhabah on land through which the main road from Minmi to Beresfield passed (Lenaghan’s Drive). At the junction of Black Hill and old
Minmi Roads, Patrick Lanaghan established a Wine Saloon which became a popular place for teamsters travelling between Minni, Tarro, Black Hill and Buttai.

Hexham Wetlands, bordering the study area, had been mapped by the surveyor Henry Dangar in 1828 and, after the Aboriginal name, was called ‘Burragilbinbing’ (Dangar 1828), later to be known as ‘Barrabinebin’ (Hartley 1986). Early use of the swamp involved agriculture on the peripheral, relatively fertile but floodprone soils, and dairying. Cattle grazing, horse agistment and agriculture resulted in the clearing of much of the forests surrounding the swamp by the 1850’s (Hartley 1986:50). Goods were brought by dray from Black Hill to Minni around the edge of the swamps. When it was the wet season and the swamp was inundated from local runoff or backwaters from the flooding Hunter River, goods were packed on horseback and swum across the water (Pollack et al 1981). One early settler recalls that in times of drought Hexham Swamp dried up and goods from Hexham could be brought straight across by dray (Hartley 1986:79).

Between the 1900’s and 1950’s the Richmond-Pelaw Colliery Railway, Great Northern Railway and Hunter Water Corporation’s Chichester Pipeline were developed. In response to local residents concerns about flooding in the Wallsend area, salt water penetration of grazing lands and the mosquito problem, floodgates on Ironbark Creek and drainage channels were installed, altering the hydrological regime of Hexham Wetlands. In the early 1960’s the Northumberland County District Planning Scheme was introduced, allowing Newcastle Council to formally zone the swamp ‘non-urban’ and ‘industrial’, with a large area set aside for a future regional airport. This plan was later discarded. Hexham Swamp Nature Reserve, covering 900 hectares east of the disused Richmond-Pelaw Colliery Railway, was dedicated in 1990 (NPWS 1996). The majority of the swamp, including the nature reserve, is classed as protected wetland (No. 840) under the State Environmental Planning Policy No. 14 (SEPP 14), and the areas immediately surrounding the wetland are zoned 7(b) Environmental Protection (Wetlands) under the Newcastle Regional and Local Environment Plans (NPWS 1996).

From these historical accounts and evidence within the study area, several conclusions can be drawn about the possible impacts of non-Aboriginal land use on the integrity of any Aboriginal sites. The implications of Dawson’s (1830) observations are that early clearing of vegetation from within parts of the study area may not have caused more than minor impacts to any archaeological deposits. Large scale cultivation is unlikely to have occurred, with the possible exception of the cleared pasture on the mid-section of the ridge crest. However, some settlers may have tended small plots for their own subsistence needs. Grazing of cattle and possibly horses almost certainly occurred across the property. Trampling by hoofed animals can cause breakage to artefacts. No evidence is present for coal mining within the current study area. It is unclear if the Wyahah village was located within the study area, but small settlers huts or camps are almost certain to have existed. It does not appear that any of the major land owners established residences of any substance, if at all, on this property. No specific references are made to Aboriginal people camping on the property during the early years of contact, but this possibility cannot be discounted.
6. PREDICTIVE MODEL OF SITE LOCATION

A predictive model of site location is constructed to identify areas of high archaeological potential (i.e. locations where there is a high probability of an archaeological site occurring), so it can be used as a basis for the planning and management of Aboriginal sites. Predictive modelling involves reviewing existing literature to determine basic patterns of site distribution. These patterns are then modified according to the specific environment of the study area to form a predictive model of site location. A sampling strategy is employed to test the predictive model and the results of the survey used to confirm, refute or modify aspects of the model.

The use of land systems and environmental factors in predictive modelling is based upon the assumption they provided distinctive sets of constraints which influenced Aboriginal land use patterns. Following from this is the expectation that land use patterns may differ between each zone, because of differing environmental constraints, and that this may result in the physical manifestation of different spatial distributions and forms of archaeological remains (Hall & Lomax 1993:26).

The predictive model is based on information from the sources discussed in preceding sections:

- identification of land systems and landform units;
- previous archaeological surveys conducted within the region;
- distribution of recorded sites and known site density;
- traditional Aboriginal land use patterns; and
- known importance of any parts of the study area to the local Aboriginal community.

In certain circumstances, such as where low surface visibility or recent sediment deposition precludes effective assessment of the potential archaeological resource, sub-surface testing may be a viable alternative for further testing the predictive model and assessing the study area.

The study area is located within the lower Hunter Valley and is comprised of the following landform units: ridge crests, spur crests, simple slopes, basal slopes, gullies, drainage depressions and swamp. The following site location predictions are made for the study area:

ARTEFACT SCATTERS: Artefact scatters are the most common site type in the locality and many have been recorded in environmental contexts comparable to those within the current study area. An artefact scatter is defined as two or more stone artefacts within one-hundred metres of each other. An artefact scatter may consist of surface material only or also contain a sub-surface deposit. Artefact scatters may represent the evidence of camp sites, where everyday activities were carried out, or transitory movement through the landscape. Dense artefact concentrations resulting from the reduction of artefacts (particularly the manufacturing of backed blades) or heat treatment of silcrete, are also reported in the locality (cf. Effenberger & Baker 1996).

The detection of artefact scatters depends upon conditions of surface visibility and ground disturbance and whether recent sediment deposition has occurred (cf. Dean-Jones & Mitchell 1993). Artefact scatters vary considerably in size, contents, structure and significance.
Within the study area there is potential for a virtual continuum of artefacts to be distributed across the elevated landform units, in a variable but generally low mean density. Densities are likely to vary extensively depending upon the nature of the activities represented and the locations of repeated activities. Relatively higher artefact densities are expected to occur in association with knapping events or frequently visited areas, and a low density ‘background’ scatter could be expected where focused activity has not occurred.

In relation to landform units, higher artefact densities may occur on low gradient landform units bordering the wetlands and watercourses (including simple slopes, basal slopes, spur crests and ridge crests). Higher densities may also occur on low gradient landform units distant from the wetlands (ridge and spur crests). Artefacts may still occur, but at a relatively lower density, on simple slopes which do not border watercourses or wetlands. There is a low potential for artefact scatters to occur within topographical contexts unsuitable for camping or other activities, such as within the drainage depression, gully and swamp landform units.

All deposits are likely to occur within the shallow A horizon soils and be of late Holocene age. The depth of archaeological deposits will be related to the depth of the soil horizon at each locality. Post-depositional processes may have affected the integrity of deposits within the A horizon to varying extents. Raw materials are likely to be predominantly silcrete and silicified volcanic tuff and artefact types will be typical of the ‘Australian Small Tool Tradition’, but with potentially high frequencies of microdebitage.

**AXE-GRINDING GROOVES:** Elongated narrow depressions in soft rocks (particularly sedimentary), generally associated with watercourses. The depressions are created by the shaping and sharpening of ground-edge axes.

Axe-grinding grooves are most likely to be located in sedimentary bedrock along watercourses, and their potential to occur within the study area is dependent upon the presence of such bedrock. This potential is assessed as being low.

**BURIALS:** Human remains tended to be placed in hollow trees, caves or sand deposits. Usually burials are only identified when eroding out of sand deposits or creek banks, or when disturbed by development. Aboriginal communities are strongly opposed to the disturbance of burial sites. The probability of detecting burials during archaeological fieldwork is extremely low.

The potential for burial sites to occur within the study area is considered to be low.

**ISOLATED ARTEFACTS:** An isolated artefact is an occurrence of a single artefact further than one-hundred metres from any other artefacts. It may represent a single discard of stone, or is the only visible evidence of an artefact scatter which cannot be detected because of conditions of low surface visibility.

Isolated artefacts may occur in virtually any location.

**MIDDENS:** Shell middens are deposits of shell, the remains of what formed part of the Aboriginal diet. Middens may also include stone, bone or shell artefacts, charcoal, or the skeletal remains of small terrestrial or aquatic fauna which were also consumed. Midden sites vary considerably in size, preservation and contents and can provide significant information on land-use patterns, diet, age and environmental conditions.
Shell middens typically occur along the margins of a swamp such as Hexham Wetlands, and would be expected both during the periods of estuarine and fresh water. However, post-depositional factors may have created unfavourable conditions for the preservation of any potential midden deposits. Hence, the potential for middens to occur within the study area is assessed as being low.

**MYTHOLOGICAL/TRADITIONAL SITES:** Mythological sites, or sites of traditional significance to Aboriginal people, may occur in any location. Often natural landscape features are the locations of mythological sites. Other sites of contemporary significance include massacre sites (the location of violent clashes between early settlers and local Aboriginals), traditional camp sites and contact sites. Consultation with the local Aboriginal community is essential to identify these site types.

After consultation with Mr Rick Griffiths and Mr Ronald Griffiths of the Mindaribba Local Aboriginal Land Council and analysis of historical literature, it is considered the potential for these sites types within the study area is very low.

**QUARRY SITES:** A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occurs. Reduction sites, where the early stages of stone artefact manufacture occur, are often associated with quarries.

Within the study area, lithic quarries only have potential to exist if outcrops of a suitable stone raw material such as volcanic tuff, or silcrete gravels, are present. Outcrops of tuff have been identified within watercourses in the district (Dean-Jones 1990, Kuskie & Kammingsa *in prep.*) and silcrete gravels have been identified immediately north of John Renshaw Drive (ERM Mitchell McCotter 1995a, 1996a) and at Thornton (Kuskie 1994b) and Bolwarra Heights (Baker 1996 *pers. comm.*). This potential is assessed as being low to moderate.

**SCARRED TREES:** Scarred trees contain scars caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters. Few scarred trees have been recorded in the locality and many mature trees have been removed as part of general land clearing or for use in the mining industry.

Mature trees, remnants of stands of the original vegetation, have the potential to contain scars. The potential for scarred trees within the study area is assessed as being low.

**STONE ARRANGEMENTS:** Stone arrangements include circles, mounds, lines or other patterns of stone arranged by Aboriginal people. Some were associated with bora grounds or ceremonial sites and others with mythological or sacred sites. A stone arrangement site has been identified near Stockrington, approximately five kilometres from the current study area.

Hill tops and ridge crests which contain stone outcrops or surface stone, and have been subject to minimal impacts from recent land use practices, are potential locations for stone arrangements. Within the study area, this potential is assessed as being low.
7. METHODS

During the initial stages of the investigation, research was conducted into the environmental and archaeological background of the study area, and a search was undertaken of the National Parks and Wildlife Service Aboriginal Site Register. Consultation was held with Mr Rick Griffiths, Co-ordinator of the Mindaribba Local Aboriginal Land Council, prior to the field survey.

Fieldwork was undertaken over two days in November 1997 by the consultant, assisted by Mr Ronald Griffiths, a representative of the Mindaribba Local Aboriginal Land Council.

Transects were inspected on foot of all landform units within the study area (Plates 2-13). Transects were biased towards areas of higher surface visibility, in order that a sufficient sample could be obtained to enable an effective assessment of the potential archaeological resource. Hence, most transects were inspected along unformed, partially formed and formed vehicle tracks. Transects were also inspected off vehicle tracks, where surface exposures were presented by tree bowls, erosion scours, cattle trails and other areas of ground disturbance. Several transects involved inspection of forests and pastures where minimal surface exposures were located.

Where identified, mature trees were inspected for evidence of Aboriginal scarring. Several mature trees were observed during the survey. Visual inspection was constantly made for the presence of outcrops of bedrock, but very few were identified.

Transects inspected are marked on Figure 3 and described below in Table 1.

Assuming a total study area of 130 hectares (1,300,000 m$^2$), the total coverage area of approximately 59,855 m$^2$ represents 4.6% of the entire study area. The total effective coverage of the study area, once the actual visible ground surface with potential for sites (archaeological visibility) is accounted for, equals approximately 4,807 m$^2$, or 0.37% of the study area. Surface visibility averaged 45% over all transects surveyed and archaeological visibility averaged 11%. The lower figure for archaeological visibility is accounted for by levels of ground disturbance (which have removed any potential artefacts), and sediment deposition (e.g. from sheetwash erosion) which obscures visibility of any potential artefacts.

Levels of effective coverage for each landform unit are outlined in Table 2. Most effective coverage was obtained of the ridge crests and simple slopes, two of the dominant landform units within the study area. However, minimal effective coverage was obtained of the spur crests, which also cover a significant area of the property. This is attributable to low conditions of surface visibility.
<table>
<thead>
<tr>
<th>Transect</th>
<th>Transect Type</th>
<th>Landform Unit</th>
<th>Slope (%)</th>
<th>Aspect</th>
<th>Dimensions of Transect (metres)</th>
<th>Coverage Total (m²)</th>
<th>Surface Visibility (%)</th>
<th>Archaeological Visibility (%)</th>
<th>Effective Coverage (m²)</th>
<th>Number of Artefacts</th>
<th>Artefact Density (no. artefacts/100 m² of effective coverage)</th>
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<tbody>
<tr>
<td>A</td>
<td>partly formed vehicle track</td>
<td>ridge crest</td>
<td>0-1</td>
<td>open</td>
<td>710 x 2</td>
<td>1420</td>
<td>50</td>
<td>10</td>
<td>142</td>
<td>1</td>
<td>0.704</td>
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<tr>
<td>B1</td>
<td>vehicle track/cable</td>
<td>simple slope</td>
<td>1-3</td>
<td>west</td>
<td>280 x 1.5</td>
<td>420</td>
<td>60</td>
<td>30</td>
<td>126</td>
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<td>ground disturbance vehicle</td>
<td>upper simple slope</td>
<td>1-3</td>
<td>west</td>
<td>20 x 10 x 40%</td>
<td>80</td>
<td>16</td>
<td>10</td>
<td>8</td>
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<tr>
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<td>vehicle track/cable</td>
<td>ridge crest</td>
<td>0-1</td>
<td>open</td>
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<td>400</td>
<td>60</td>
<td>30</td>
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<td>C</td>
<td>well formed vehicle track in</td>
<td>simple slope</td>
<td>2-3</td>
<td>west</td>
<td>320 x 3</td>
<td>960</td>
<td>90</td>
<td>2</td>
<td>19</td>
<td>0</td>
<td></td>
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<td>unformed vehicle track</td>
<td>ridge crest</td>
<td>0-2</td>
<td>open</td>
<td>710 x 3</td>
<td>2130</td>
<td>30</td>
<td>25</td>
<td>532</td>
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<tr>
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<td>simple slope (gently)</td>
<td>8-12</td>
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<td>50 x 5</td>
<td>250</td>
<td>60</td>
<td>30</td>
<td>75</td>
<td>0</td>
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<tr>
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<td>unformed vehicle track/cable</td>
<td>simple slope</td>
<td>8-12</td>
<td>west</td>
<td>50 x 2</td>
<td>100</td>
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<td>10</td>
<td>10</td>
<td>0</td>
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<td>ridge crest/spur crest</td>
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<td>open/east</td>
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<td>spur crest</td>
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Table 1: Summary of Transect Data (continued)

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<th>Landform Unit</th>
<th>Slope (°)</th>
<th>Aspect</th>
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<th>Surface Visibility (%)</th>
<th>Archaeological Visibility (%)</th>
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</tr>
<tr>
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Table 2: Comparison of Effective Survey Coverage per Landform Unit.

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<th>No. of Artefacts</th>
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<td>0</td>
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Figure 3: Location of Transects Surveyed (Base map courtesy Newcastle City Council).
8. RESULTS AND DISCUSSION

Seven artefact scatters and five isolated artefacts were located during the current survey. In addition, one previously recorded artefact scatter and one isolated artefact (Resource Planning 1992a) are also located within the study area. The locations of these artefact occurrences are marked on Figures 1 and 4. The sites recorded during the current survey are discussed below and summarised in Table 3. Appendix 1 (Plates 2-13) contains photographs of the sites.

Conditions of surface visibility were reasonably high along the transects surveyed. This was one of the primary factors in the selection of the location of each survey transect. However, outside of the survey transects, a dense cover of vegetation frequently limited visibility. While surface visibility averaged 45% over all transects surveyed, archaeological visibility (visible ground surface with potential for sites) averaged only one quarter of surface visibility (11%). The lower percentage of archaeological visibility is due to a number of detection limiting factors, such as sediment deposition and ground disturbance, along the survey transects. While total survey coverage represents approximately 4.6% of the study area, effective coverage (accounting for archaeological visibility) represents just 0.37% of the study area.

The key issue is whether this level of effective survey coverage is satisfactory to test the predictive model of site location and provide an indication of the potential archaeological resources of the property. The archaeological survey has enabled an effective assessment of the predictive model of site location and archaeological potential of the property, as coverage was obtained of all landform units (except the wetlands) (refer to Table 2) and archaeological evidence was identified as predicted in most of these units. Nevertheless, the sample obtained is small in comparison to the size of the property, and any conclusions based on it must be viewed as being preliminary in nature.

As Dean-Jones and Mitchell (1993) observed, most artefact occurrences in the Hunter Valley have only been identified in exposures created by sheet erosion. Within the current study area, erosion scours are infrequent, particularly on the low spurs. Most artefact occurrences were identified in erosion scours or on vehicle tracks. For every artefact occurrence, the limited extent of surface exposures in which the artefacts were identified has constrained the delineation of site boundaries (or at least transition zones between higher artefact densities within 'sites' and lower artefact densities of 'background scatter'). Every artefact occurrence is predicted to have a moderate or high potential to extend over a larger area of at least the same landform unit (Table 3). Hence, the results of the survey are to an extent a function of conditions of surface visibility, with the artefacts representing locations where windows of visibility enabled detection of the underlying resource.

Artefact occurrences 3, 4 and 10 are located near the eastern boundary of the property. Isolated artefact 5 may occur marginally outside of the property. Site 4 extends both within and adjacent to the current study area. Site 10 is probably situated within the property under investigation.

Levels of ground disturbance varied at each artefact occurrence but were generally moderate to low (Table 3). Considering that less disturbed vegetated land often was present adjacent to the transects on which ground disturbance was assessed, there is a high probability for many of the sites to be relatively unaffected by recent land use practices. However, site integrity will depend on the age of the site and the extent of effects from post-depositional processes (particularly bioturbation and sheetwash erosion). This issue cannot be resolved without controlled excavation.
Almost every site has a moderate to high potential to contain a sub-surface deposit of artefacts within the A horizon soil (Table 3). Such deposits are likely to be of late Holocene age.

Artefacts were identified on ridge crests and simple slopes, and wetland bordering spur crests, basal slopes and simple slopes. Within the recorded sites (Table 3) and survey transects (Tables 1 & 2), there is a tentative trend for higher artefact densities to occur on the wetland bordering basal slopes and spur crests. However, the sample size is small and this result provides a preliminary indication only. Nevertheless, a similar trend for higher artefact densities on simple slopes and basal slopes bordering Woodberry Swamp was identified by Kuskie (1994b) at Thornton. At site 38-4-375, Silcox and Ruig (1995) also identified a trend for higher artefact densities on the margin of the ridge crest, closer to the wetlands.

Comparison of artefact densities with other environmental factors may indicate trends relevant to predicting the nature of the archaeological resources across the study area. Across the transects surveyed, the degree of slope was generally low (less than 3°) and virtually all artefacts were identified within this class. As low gradient slopes dominate the study area, slope is not likely to be a key factor in site location (at least for differentiating the positions of activity areas within the study area). In a regional context, low gradient slopes are preferred locations for occupation sites. Within the Black Hill locality, similar level or gently sloping terrain is common, indicating that a focus of occupation within the study area is unlikely to be solely related to this factor.

Half of the artefact occurrences are located within 100 metres of a water source (wetlands or drainage depression). 75% occur within 150 m of a source and none are located further than 250 m from a source (Table 3). This reflects in part the nature of the topography of the study area. As the drainage depressions are only likely to have carried water after periods of rain, proximity to a more permanent water source (and abundant subsistence resources) in the adjacent wetlands is relevant. Three artefact occurrences are situated within 50 m of the wetlands and there is a tentative trend for higher artefact densities to occur in this zone. The remaining sites are situated between 200 and 650 m from the wetlands (Table 3). The results are preliminary in nature and indicate that artefact occurrences will be situated in locations away from the wetlands, but that artefacts may occur at a higher density adjacent to the wetlands (possibly reflecting a focus of occupation closer to the wetlands).

The aspect of sites (a factor in the amount of solar radiation and hence the favourability for habitation and potential depth of the soil profile) is generally open on the ridge crest, easterly on the spur crests and simple slopes leading to the wetlands, and westerly on simple slopes distant from the wetlands (Table 3). In part this reflects the nature of the topography of the study area and no clear trends in artefact density are apparent.

A total of 31 artefacts were recorded during the survey. In addition, 19 pieces of heat shatter were also recorded. These are listed in Table 4, along with their provenance.

Silcrete is the dominant raw material (68%) of the combined assemblages, with a lower frequency of silicified volcanic tuff identified (29%). One artefact (a ground-edge hatchet) was manufactured from 'greenstone', a slightly metamorphosed form of basalt or a similar basic igneous rock, foreign to the locality. No sources of volcanic tuff or silcrete were identified within the property. The shallow and depositional nature of the drainage depressions indicates that it is unlikely that exposures of tuff bedrock will occur. Silcrete gravels, such as those identified at the Holmwood Industrial Estate (Resource Planning 1995a, 1996a) and Thornton (Kuskie 1994a, b), are not present. Nevertheless, while stone raw materials may not have been available from within the study area itself, local sources of silicified tuff and silcrete are in
close proximity. Cobbles of silcrete or tuff could have been transported to the study area for reduction and use.

52% of the artefacts exhibit evidence of heat treatment, primarily a distinctive red colour (resulting from thermal alteration of iron oxides to haematite) and occasionally the presence of a vitreous lustre. Insufficient evidence exists to determine whether heat treatment occurred on site or at another location (e.g. the source of the material). The presence of 19 pieces of heat shattered silcrete (thermally altered stone lacking diagnostic attributes) is further evidence for the frequent local use of heat treated stone.

Broken flakes (35% of the combined assemblages) and flaked pieces (29%) are the dominant artefact types, with minor frequencies of flakes, broken blades, broken cores, a blade core, blade and a ground-edge hatchet. These artefacts tend to be small (maximum dimension less than 40 mm). The hatchet head (Plate 14) is an uncommon artefact type and is in an excellent state of preservation. It is made from a raw material foreign to the district. Grinding grooves, primarily formed by the grinding of hatchet heads, often occur in the sandstone bedrock of watercourses in the district, but are absent from the study area. The hatchet was an essential part of the Aboriginal toolkit (cf. Dawson 1830, Mathews 1894 and Threlkeld in Gunson 1974). Hatchets were used to cut saplings for building shelters, for stripping bark from trees, cutting notches in trees for climbing, and cutting toeholds in trees to procure animals or honey from bee nests (Mathews 1894).

No temporally diagnostic artefacts such as Bondi points were present, but the assemblage is generally comparable to others in the locality (cf. Baker 1996, Kuskie 1994b, Kuskie & Kamminga in prep., Silcox & Ruig 1995) which contain artefacts synonymous with the mid-late Holocene. The frequencies of artefact types and raw materials are also comparable to other sites recorded in the locality (cf. Baker 1996, Kuskie 1994b, Kuskie & Kamminga in prep., Silcox & Ruig 1995). As discussed above, the topographical context of the sites (landform units, slope and proximity to watercourses and/or wetlands) is also similar to other recorded artefact scatters in the district.

Due to the small nature of the sample and conditions of low surface visibility, which limited identification of the extent of individual sites, minimal information is available to assess the possible functions of the sites and nature of the activities represented. Assuming that the recorded artefacts represent a small sample of the archaeological resource potentially present, as revealed only through ‘windows’ of surface visibility, the evidence could be part of a broader resource reflecting transitory movement between camp sites and food sources, procurement of food (hunting, gathering and processing), camping, stone and wooden artefact manufacturing, heat treatment or other activities.

A number of surveys and excavations in the Lower Hunter have identified a virtually continual distribution of artefacts across the landscape, at varying densities (cf Effenberger & Baker 1996, Kuskie 1994a, b, Kuskie & Kamminga in prep., Silcox & Ruig 1995). These results lend support to arguments that the landscape should be viewed as an archaeological continuum in which sites represent points where higher frequencies of activities have occurred (cf. Foley 1981). The definition of an artefact scatter ‘site’ is often an arbitrary one, which offers benefits for planners and cultural resource managers, but creates various theoretical/analytical problems for archaeological analysis. In New South Wales, an artefact scatter is often defined as being two or more artefacts within 100 m of each other. This definition of an artefact scatter site is followed here. However, the analytical usefulness of the site concept to archaeologists has long been questioned and it has been advocated that the individual artefact is a more useful basic unit of analysis (cf. Dunnell & Dancey 1983).
Utilising this approach, it can be argued that the entire landscape of the study area was probably used to differing extents and that the evidence located during the current survey is largely a function of conditions of surface visibility. The limited surface visibility also prevented an assessment of the extent of the recorded sites and prevented the identification of sites across much of the property, where the predictive model indicates evidence has a moderate or high potential of occurring (Figure 5).

The predictive model of site location, developed in Section 6, has been generally reinforced by the small survey sample. There remains a high potential across much of the study area for further artefact scatter sites to occur. In fact, a virtual continuum of artefacts may be distributed at a variable, but generally low, density across the elevated landform units. Relatively higher artefact densities are expected to occur in association with knapping events or frequently visited areas, and a low density ‘background’ scatter could be expected where focused activity has not occurred. In relation to landform units, higher artefact densities may occur on low gradient landform units bordering the wetlands and watercourses (including simple slopes, basal slopes, spur crests and ridge crests) (Figure 5). Higher densities may also occur on low gradient landform units distant from the wetlands (ridge and spur crests). Artefacts may still occur, but at a relatively lower density, on simple slopes which do not border watercourses or wetlands. There is a low potential for artefact scatters to occur within topographical contexts unsuitable for camping or other activities, such as within the drainage depression, gully and swamp landform units (Figure 5). All deposits are likely to occur within the shallow A horizon soils and be of late Holocene age. Post-depositional processes may have affected the integrity of deposits within the A horizon to varying extents. Raw materials are likely to be predominantly silcrete and silicified volcanic tuff and artefact types will be typical of the ‘Australian Small Tool Tradition’.

The potential for lithic quarry sites or grinding groove sites is reassessed as being low to very low, based on inspection of the local geology. Statements of the predictive model regarding the low potential for other site types (such as middens, mythological sites, scarred trees and stone arrangements) have not been contradicted by the survey results.
<table>
<thead>
<tr>
<th>Site No.</th>
<th>Site Type</th>
<th>Grid Reference</th>
<th>Landscape Unit</th>
<th>Exposure Type</th>
<th>Slope (%)</th>
<th>Distance to Water (metres)</th>
<th>Distance to Wetlands (metres)</th>
<th>Aspect</th>
<th>No. of Artifacts</th>
<th>Gross Site Area (m²)</th>
<th>Archaeological Visibility (%)</th>
<th>Minimum Artifacts Density (per lm² effective site area)</th>
<th>Ground Disturbance</th>
<th>Potential to be larger</th>
<th>Potential for subsurface deposits</th>
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<td>greenstone</td>
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<td>At one margin ground 50-10 mm back from edge on one face and 22mm on opposite face (Plate 14).</td>
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<td>laminated yellow siliciified tuff</td>
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<td>heat treated broken core</td>
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<td>30% pebble cortex, conjoint with 1</td>
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<td>heat shutter</td>
<td>silcrete</td>
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<td>large chips in silcrete</td>
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Figure 4: Location of Sites Recorded (Base map courtesy Newcastle City Council).
Figure 5: Location of Zones of Archaeological Potential (Base map courtesy Newcastle City Council.

An Aboriginal Archaeological Assessment of a Newcastle City Council Property at the Corner of Lenaghans Drive and John Rankin Drive, Beresfield, Lower Hunter Valley, NSW. Peter J. Kuczie 1997.
9. ABORIGINAL CONSULTATION

The study area lies within the boundaries of the Mindaribba Local Aboriginal Land Council. Mr Rick Griffiths, Co-ordinator of the Land Council, was contacted during the initial stages of the investigation to inform the Land Council of the project and to arrange for the participation of a representative during the field survey.

Subsequently the consultant met with the Mindaribba Local Aboriginal Land Council representative, Mr Ronald Griffiths, who participated in the field survey for its duration. Following completion of the survey, the consultant met with Mr Rick Griffiths to discuss the survey results.

A written report was requested from the Mindaribba Local Aboriginal Land Council but has not yet been received. Upon receipt by the consultant, a copy will be forwarded to Newcastle City Council.

The Mindaribba Local Aboriginal Land Council has expressed a strong interest in the results and the potential for further sites to exist within the study area. The Land Council has been actively involved in identifying and conserving their cultural heritage within the Maitland region for a number of years. In the event that possible impacts may occur to Aboriginal heritage through future development proposals, the Land Council is of the opinion that a thorough assessment should be made of the resource, including sub-surface testing where sites potentially occur but are obscured by vegetation cover.

A copy of the completed report will be forwarded to the Mindaribba Local Aboriginal Land Council.
10. SIGNIFICANCE ASSESSMENT

10.1 Assessment of Significance of Aboriginal Sites

The NSW National Parks and Wildlife Service is responsible for the protection of Aboriginal relics on any land within New South Wales. It is an offence under the *NSW National Parks and Wildlife Act, 1974* to knowingly destroy, deface or damage a relic or Aboriginal Place, without the prior written permission of the Director of the NSW National Parks and Wildlife Service. The information contained within this report and the assessment of significance of archaeological sites provides the basis for the NSW National Parks and Wildlife Service to make informed management decisions regarding the degree of protection which should be afforded to specific sites.

The significance of archaeological sites can be assessed according to the following criteria:

a) archaeological value;

b) significance to Aboriginal people;

c) educational value;

d) historic value; and

e) aesthetic value.

Greater emphasis is generally placed on criteria (a) and (b) when assessing the significance of Aboriginal archaeological sites in Australia.

Archaeological value refers to the potential of the site to answer further research questions; the contents of the site; their state of preservation; and the representativeness of the site type. Representativeness is generally assessed at local, regional and national levels. It is an important criteria, because the primary goal of cultural resource management is to afford greatest protection to a representative sample of site types throughout a region. The more unique or rare a site is, the greater its value as being representative of that particular site type in a region.

Aboriginal significance refers to the value placed upon a site by the local Aboriginal community. All archaeological sites have some contemporary significance to Aboriginal people, because they represent an important tangible link to their past and to the landscape. Sites may be part of the living Aboriginal culture or be significant because of their connection to spiritual beliefs or as a part of post-contact Aboriginal history. Consultation with representatives of the Mindaribba Local Aboriginal Land Council is essential to identify the level of Aboriginal significance.

Educational value refers to the potential of the site as an educational resource for groups within the community.

Historic value refers to the importance of the site as a location of an historic event, phase, figure or activity.

Aesthetic value includes all aspects of sensory perception. This criteria mainly applies to art or mythological sites.
10.2 Significance of Sites Located Within the Study Area

Seven artefact scatters and five isolated artefacts were located within the study area during the current survey. An additional isolated artefact and an artefact scatter have previously been recorded within the study area (Resource Planning 1992a).

For each of these artefact occurrences, evidence available from which to make an assessment of site significance is limited. This is partly a result of conditions of low surface visibility throughout the property (particularly adjacent to recorded sites) and the nature of geomorphological processes (sediment deposition burying and obscuring sites). Evidence which is required to adequately assess the significance of these artefact occurrences includes information about the presence of sub-surface deposits, integrity of these deposits, nature of the sites' contents and extent of the sites. From this information, the sites can be compared within a local and regional context to determine their representativeness (and hence priorities for conservation on local and regional scales), and the scientific value of the sites (particularly the capacity for using evidence from these sites to address relevant research questions, for which other evidence may not be available from other sites).

Hence, based on current evidence, a 'potential' level of scientific significance for each artefact occurrence is indicated (Table 4). This assessment could be substantially revised upward or downward if further investigation enables clarification of the issues outlined above.

The majority of artefact occurrences are assessed as being of potentially moderate or high archaeological significance within a local context, primarily on the basis of the predicted existence of sub-surface deposits, the potential for the sites to be substantially larger, and potentially moderate or high site integrity. Studies of sites within similar contexts indicate that a range of activities (e.g. camping, stone tool reduction, food procurement and processing, and heat treatment) may be represented by archaeological evidence in the study area. Within a regional context, the issue of representativeness is important, as few areas in similar environmental contexts (elevated, low gradient terrain bordering wetlands) remain unaffected by urban development.

All Aboriginal heritage is of interest to the Mindaribba Local Aboriginal Land Council. The Land Council has expressed a strong interest in the value of these sites (Appendix 2) as they have for many other Aboriginal sites within the district. All sites tend to be of some contemporary significance to Aboriginal people, because of the link they represent with the past and the lifestyles and values of community ancestors.

Table 4: Significance Assessment.

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Archaeological Significance</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated Artefact 1</td>
<td>low/moderate local</td>
<td>low/moderate integrity, isolate</td>
</tr>
<tr>
<td>Isolated Artefact 2</td>
<td>low/moderate local</td>
<td>high integrity, isolate</td>
</tr>
<tr>
<td>Isolated Artefact 3</td>
<td>high local</td>
<td>possible high integrity &amp; research potential</td>
</tr>
<tr>
<td>Site 4</td>
<td>high local</td>
<td>possible high integrity &amp; research potential, contents</td>
</tr>
<tr>
<td>Site 5</td>
<td>low local</td>
<td>low research potential</td>
</tr>
<tr>
<td>Site 6</td>
<td>moderate local</td>
<td>possible integrity and research potential</td>
</tr>
<tr>
<td>Isolated Artefact 7</td>
<td>low/moderate local</td>
<td>isolate, some research potential</td>
</tr>
<tr>
<td>Isolated Artefact 8</td>
<td>low/moderate local</td>
<td>isolate, some research potential</td>
</tr>
<tr>
<td>Site 9</td>
<td>high local</td>
<td>possible high integrity &amp; research potential</td>
</tr>
<tr>
<td>Site 10</td>
<td>high local</td>
<td>possible moderate integrity &amp; high research potential</td>
</tr>
<tr>
<td>Site 11</td>
<td>moderate/high local</td>
<td>possible research potential, moderate integrity</td>
</tr>
<tr>
<td>Site 12</td>
<td>moderate/high local</td>
<td>low research potential, isolate</td>
</tr>
<tr>
<td>Isolated Artefact MB1</td>
<td>low local (Resource Planning 1992a)</td>
<td>low research potential</td>
</tr>
<tr>
<td>Site MB2</td>
<td>low local (Resource Planning 1992a)</td>
<td>low research potential</td>
</tr>
</tbody>
</table>
11. MITIGATION AND MANAGEMENT STRATEGIES

Newcastle City Council is seeking to sell the property under investigation. The majority of the land is zoned 2(a) Residential and the wetlands are zoned 7(b) Environmental Protection (Wetlands) under the Newcastle Local Environmental Plan 1987. The development proposal of any prospective buyer may have a range of impacts upon the identified and potential Aboriginal archaeological resources, depending upon the nature of any such proposal. Potential impacts would correspond to the intensity and size of the development.

Several strategies can be considered for the management and conservation of the identified and predicted archaeological resources within the study area:

Option A (Further Investigation):

In circumstances where a site is identified, but the extent of the site, the nature of its contents, its level of integrity and/or its level of significance cannot be adequately assessed solely through surface survey (generally because of conditions of low surface visibility), sub-surface testing may be an appropriate strategy to further assess the site.

Testing is also appropriate in locations where artefact deposits are predicted to occur through application of the predictive model of site location, in order to identify whether such deposits exist and their nature, extent, integrity and significance.

Test excavations can take the form of shovel pits, mechanically excavated trenches or grader scrapes. A permit is required from the NSW National Parks and Wildlife Service to undertake sub-surface testing. Approval can take up to eight weeks, following receipt by the NPWS of all necessary information. A research design specifying the aims and methods is an essential component of a Permit application and therefore requires approval from the NPWS. A letter of comment is also required from the Local Aboriginal Land Council.

This is a pro-active strategy, which should result in the identification, assessment and management of the Aboriginal heritage resource prior to any development activity occurring. Following assessment of each Aboriginal site, management strategies as outlined below (B - D) can be applied.

The alternative strategy for zones where archaeological deposits are predicted to occur is to monitor construction, particularly any initial ground disturbance works, for the presence of artefacts. However, practical experience indicates that monitoring has few benefits, unless soil from the spoil heap is passed through wire mesh sieves. Monitoring for artefacts is a reactive strategy that is not preferred within the context of the current investigation, because it could result in substantial and costly delays to construction, late revisions to development plans, and/or cause undesirable impacts to sites of Aboriginal or archaeological significance.

Option B (Destruction):

A development proponent can apply to the NSW National Parks and Wildlife Service for a Consent to Destroy permit for any known relics. This permit must be obtained prior to the commencement of works affecting any sites, because all relics are protected under the terms of the NSW National Parks and Wildlife Act, 1974. The support of the Mindaribba Local Aboriginal Land Council should be obtained through further liaison, for any Consent to Destroy application. The NPWS guarantees to process Permit applications within eight weeks, subject to receipt of all necessary information. This strategy is typically suitable when a site is
of low archaeological significance, the local Aboriginal community holds no objections, and it is unfeasable to implement any other strategy.

Option C (Conservation):

Conservation of a site or portion thereof, possibly incorporating an area of predicted archaeological resource, could be obtained through zoning within open space accompanied by appropriate protective measures (e.g. avoidance of works involving ground disturbance, prevention of damage from vehicles and pedestrians). This strategy is suitable for all sites, but particularly those of high archaeological significance and/or value to the local Aboriginal community.

Option D (Salvage):

In circumstances where an artefact occurrence is of moderate or high significance within a local context, but the options for conservation are limited and the surface collection of artefacts or excavation of deposits could yield benefits to the Aboriginal community and/or the study of Aboriginal occupation, the strategy of salvage could be considered. Salvage may include the collection of surface artefacts or systematic excavation of deposits, as part of a Consent to Destroy and Permit to Salvage required from the National Parks and Wildlife Service. This strategy is a primary means of minimising impacts to Aboriginal heritage from development projects where the option of conservation is not feasible.
12. RECOMMENDATIONS

The following recommendations are made on the basis of legal requirements under the *NSW National Parks and Wildlife Act, 1974*, the results of the survey and consultation with the Mindaribba Local Aboriginal Land Council. As development plans have not been specified for the subject property, these recommendations are of a general nature only, intended to guide prospective proponents on the constraints presented by the identified and potential archaeological resources and the options for minimising these constraints:

1. It is reminded that under the terms of the *National Parks and Wildlife Act, 1974* it is an offence to knowingly destroy, damage or deface an Aboriginal relic without the prior written permission of the Director of the NSW National Parks and Wildlife Service;

2. Archaeological evidence has been identified at fourteen locations within the property. Several options are available for the management of these resources:
   a) A proponent could liaise with the Mindaribba Local Aboriginal Land Council to seek their support for an application to the NSW National Parks and Wildlife Service for a Consent to Destroy Permit for any of the relics;
   b) A proponent could liaise with the Mindaribba Local Aboriginal Land Council to seek their support for an application to the NSW National Parks and Wildlife Service for a Consent to Destroy and Permit to Salvage for any of the relics;
   c) A proponent could examine the option of conservation for any of the relics; and,
   d) A proponent could undertake further archaeological investigations of any site where required in order to determine the site’s extent, nature of contents, integrity and level of significance, as a prelude to applying one of options 2(a), 2(b) or 2(c) above. An application to the NSW National Parks and Wildlife Service for a Preliminary Research Permit would be necessary;

3. Zones with a moderate or high potential to contain archaeological resources, but which could not be identified through the field survey because of conditions of low surface visibility, have been identified (Figure 5). Several options are available for the management of these potential resources:
   a) A proponent could consider measures to ensure the conservation of some of these potential archaeological resources;
   b) A proponent could undertake further archaeological investigations of any zone with potential resources in order to determine the existence of any relics, and their extent, nature of contents, integrity and level of significance, as a prelude to applying one of options 2(a), 2(b) or 2(c) above. An application to the NSW National Parks and Wildlife Service for a Preliminary Research Permit would be necessary;

4. Archaeological investigations should only be undertaken by a qualified archaeologist in full consultation with the Mindaribba Local Aboriginal Land Council. The Land Council should be afforded the opportunity to comment on the research designs of future studies and to be involved in site management decisions. A representative should be engaged to assist with any fieldwork;
5. Four copies of this report should be forwarded to:

   Cultural Heritage Unit Manager
   Sydney Zone
   Aboriginal Heritage Division
   NSW National Parks and Wildlife Service
   PO Box 1967
   Hurstville NSW 2220

6. A single copy of this report should be forwarded to:

   Mr Rick Griffiths
   Co-ordinator
   Mindaribba Local Aboriginal Land Council
   PO Box 453
   Maitland NSW 2320
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Plate 1: View of Hexham Wetlands between the two spurs within the eastern part of the study area.

Plate 2: Isolated Artefact 1, within Transect A.
Plate 3: Isolated Artefact 2, within Transect II.

Plate 4: Isolated Artefact 3, within Transect J (foreground), Hexham Wetlands and 'Glenrowan' property.
Plate 5: Site 4, within Transect M, and adjacent wetlands.

Plate 6: Site 5 within Transect N2.
Plate 7: View west along water pipeline easement of Site 6 (background), within Transects O1 & V4.

Plate 8: View east along water pipeline easement of Isolated Artefact 7 and Transects O2 and V3.
Plate 9: Isolated Artefact 8, Transects O5 and V6 and pumping station.

Plate 10: View of site 9 within Transect O7 (foreground), New England Highway along northeastern corner of property and Transects V7 and W1 (background).
Plate 11: View south of Transect W2 (foreground) and site 10 and Transect Q (background).

Plate 12: View of Site 11, within Transect T2, minor watercourse and John Renshaw Drive.
Plate 13: Site 12, within Transect T3.

Plate 14: Ground-edge hatchet head from Site 4.