Appendix E

Aboriginal Heritage Impact Assessment

Bloomfield Colliery Completion of Mining and Rehabilitation

Part 3A Environmental Assessment

November 2008

BLOOMFIELD COLLIERY,
HUNTER VALLEY,
NEW SOUTH WALES:
COMPLETION OF MINING AND
REHABILITATION PROJECT -
ABORIGINAL HERITAGE IMPACT ASSESSMENT

A report to

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September 2008

EXECUTIVE SUMMARY

Bloomfield Collieries Pty Ltd has lodged a Part 3A Major Project application for the completion of open-cut coal mining and rehabilitation of areas within Mining Lease CCL761. The application area is located several kilometres south of East Maitland in the Lower Hunter Valley of New South Wales. It measures a total of 318 hectares and includes all of the existing Mining Operations Plan approved area, as well as a workshop area, an access road to the workshop and a haul road from the active mining area to the washery coal stockpile pad.

South East Archaeology has been commissioned by Bloomfield Collieries to undertake an Aboriginal heritage impact assessment for this Part 3A Major Project application. The principal aims of the assessment were to identify and record any Aboriginal heritage evidence or cultural values within the study area, assess the potential impacts of the proposal on this evidence, assess the significance of this evidence, and formulate recommendations for the conservation and management of this evidence, in consultation with the local Aboriginal community.

The investigation proceeded by recourse to the archaeological and environmental background of the locality, followed by a field survey undertaken with representatives of the local Aboriginal community, in accordance with the relevant Department of Environment and Climate Change (DECC) policies and Department of Planning (DoP) requirements.

Approximately 210 hectares of the study area comprises land that has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive. Apart from reconnaissance inspection, the Aboriginal heritage investigation subsequently focused on the remaining "unmodified area" of 108 hectares (land yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut) in which there remains some potential for heritage evidence.

The "unmodified" portion of the study area was subdivided and inspected within 26 environmentally discrete survey areas. The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 15.4% of the unmodified study area. The total effective survey coverage (*visible* ground surface physically inspected, with potential to host heritage evidence) equated to around 1.9% of the unmodified study area. The level and nature of effective survey coverage is considered satisfactory to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the study area.

Even within this "unmodified" area, levels of ground disturbance are typically high, due to the removal of the forest vegetation in early 2004 by earthmoving equipment under existing approvals. This process has extensively impacted the A unit soil (in which stone artefacts could be expected to occur), often totally removing it or covering it with B unit clay (culturally sterile), and thereby reducing the levels of archaeological visibility and effective survey coverage. The extent of vegetation removal through the use of earthmoving equipment has also substantially lowered the potential for most other forms of heritage evidence (eg. carved trees, scarved trees and stone arrangements).

A total of six Aboriginal heritage sites, comprising nineteen loci of identified evidence, have been recorded within the 108 hectare unmodified portion of the study area. These site loci are all stone artefact occurrences and contain a total of 53 artefacts. The identified artefact evidence occurs in a very low density distribution. Further artefacts are expected to occur across the unmodified study area in a distribution and density consistent with the survey results. However, notwithstanding that shallow deposits may be present in some forested areas or along the drainages where A unit soil may have been retained, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value is low to very low. Other types of heritage evidence (eg. scarred trees and grinding grooves) are not anticipated to occur within the unmodified study area (ie. very low or negligible potential) and other Aboriginal cultural values or associations have not been identified.

The significance of the Aboriginal heritage evidence was assessed along criteria derived from relevant aspects of the ICOMOS Burra Charter and 'State Heritage Inventory Evaluation Criteria and Management Guidelines'. It is important to observe that all heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Sites B2, B16, B18, B19, B20 and B22 are assessed as being of low scientific significance within a local context, due to their common nature, low representative value, low integrity and limited potential for deposits that may be *in situ* and/or of research value.

The Aboriginal heritage evidence recorded within the study area is protected under the terms of the *National Parks and Wildlife Act 1974*. No impacts should occur within any of the Aboriginal site areas in the absence of a valid Section 90 Consent or *in lieu*, Part 3A approval.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the proposal on Aboriginal heritage will be low. The following management and mitigation measures are proposed, with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the survey and consultation with the local Aboriginal community:

- An Aboriginal Heritage Management Plan must be formulated in consultation with the registered Aboriginal stakeholders who have sought further involvement in the project (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation), prior to any development impacts occurring, to specify the policies and actions required in every conceivable circumstance to mitigate and manage the potential impacts of the proposal on Aboriginal heritage after Part 3A approval is granted. The plan will include procedures for ongoing Aboriginal consultation and involvement, mitigation measures for the identified and potential Aboriginal evidence, management procedures for any previously unrecorded evidence and skeletal remains, cultural awareness training for mine staff and contractors, and review of the plan. The Plan will comprise a detailed Statement of Commitments that, subject to Part 3A project approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Consent. The primary elements of the Plan are:

    - In order to mitigate the impacts of development upon the cultural and scientific values of the heritage evidence and to retrieve and conserve samples of evidence, a program of salvage will be undertaken within the development impact area. This will involve representatives of the registered Aboriginal stakeholders collecting identified stone artefacts from sites B2, B16, B18, B19, B20 and B22 prior to any development impacts occurring; and

    - Should any skeletal remains be detected during the course of development, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, DECC and Mindaribba LALC; and

- Further consultation will be pursued with the registered Aboriginal stakeholders who have sought further involvement in the project (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation) in relation to the proposal and the contents and recommendations of this investigation. The continued involvement of these registered Aboriginal stakeholders in the ongoing management of the heritage resource within the study area will be promoted.

After implementation of these management and mitigation measures, it is concluded that the risk of residual impacts to Aboriginal heritage from the proposal will be very low.

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1. INTRODUCTION

Bloomfield Collieries Pty Limited is the owner and operator of Bloomfield Colliery, located approximately 1.5 kilometres south of the East Maitland urban area in the Lower Hunter Valley (Figures 1 and 2). Coal has been extracted from the Bloomfield area for approximately 170 years, with the current owners purchasing the Bloomfield operation in 1937. Bloomfield is now in the final stages of its planned open cut mining program and is actively rehabilitating former mining areas on the site.

Bloomfield Collieries currently operates under Consolidated Coal Lease 761 (CCL 761) and works are in accordance with a Mining Operations Plan (MOP) approved by the Department of Primary Industries (DPI) and an Environmental Protection Licence issued under the Protection of the Environment Operations Act, 1997. Underground mining occurred on the site until 1992. Currently, the operation consists of open cut mining, an on-site Coal Handling and Preparation Plant ('washery') and a rail loading facility that transports processed coal to the Port of Newcastle (Figure 3).

Bloomfield Collieries operates under 'Existing Use Rights' as defined by Division 10, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), which enables certain mining development on pre-existing mines. The introduction of Part 3A of the EP&A Act provides a new framework for Bloomfield Collieries to obtain consent for it to complete its operations and undertake rehabilitation.

As such, Bloomfield Collieries has lodged a Part 3A Major Project application with the Department of Planning (DoP) for the completion of open-cut coal mining and rehabilitation of areas within Mining Lease CCL761. The Part 3A Project Application area includes all of the Mining Operations Plan approved area, as well as the workshop area, access road to the workshop and the haul road from the active mining area to the washery ROM coal stockpile pad, as marked on Figures 2 and 3. The continued use of the coal washery and rail loading facility, including the management of water associated with the washery and use of tailings in site rehabilitation, is included in the Part 3A Environmental Assessment recently approved for Donaldson Coal's adjacent Abel Underground Mine.

South East Archaeology Pty Ltd was engaged in May 2007 by Bloomfield Collieries to undertake an Aboriginal Heritage Impact Assessment for this Part 3A application. The key Environmental Assessment requirements of the Department of Planning in relation to Aboriginal heritage, which has been identified as a "key issue", include:

- A description of the existing environment;
- An assessment of the potential impacts of the project, including cumulative impacts;
- A description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor the impacts of the project; and
- The Environmental Assessment should take into account relevant State government technical and policy guidelines, including for Aboriginal heritage the draft DECC *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005) and *Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997).

The principal aims of the Aboriginal heritage impact assessment are therefore to:

- Undertake research, register searches and an archaeological survey and consultation with the Aboriginal community to identify and record any Aboriginal heritage evidence, areas of potential evidence and cultural values within the study area;
- Assess the potential impacts of the proposal upon any identified or potential Aboriginal heritage evidence or cultural values;
- Assess the significance of any Aboriginal heritage evidence or cultural values identified;
- Provide details of any Aboriginal heritage evidence in accordance with Department of Environment and Climate Change (NSW) (DECC) requirements;
- Consult with the local Aboriginal community as per the DECC policy entitled *Interim Community Consultation Requirements for Applicants*;
- Present recommendations for the management of any identified Aboriginal heritage evidence, potential heritage resources or cultural values; and
- Prepare a formal archaeological report to meet the requirements of DECC and DOP, including the draft DECC *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005) and *Aboriginal Cultural Heritage Standards and Guidelines Kit* (1997).

The heritage investigation has proceeded by recourse to the archaeological and environmental background of the locality, followed by a field survey undertaken with the assistance of representatives of the registered Aboriginal stakeholders. This investigation has been undertaken by archaeologists (Peter Kuskie and Caroline Ingram) with appropriate qualifications and experience in Aboriginal heritage, in accordance with the DoP and DECC requirements and guidelines.

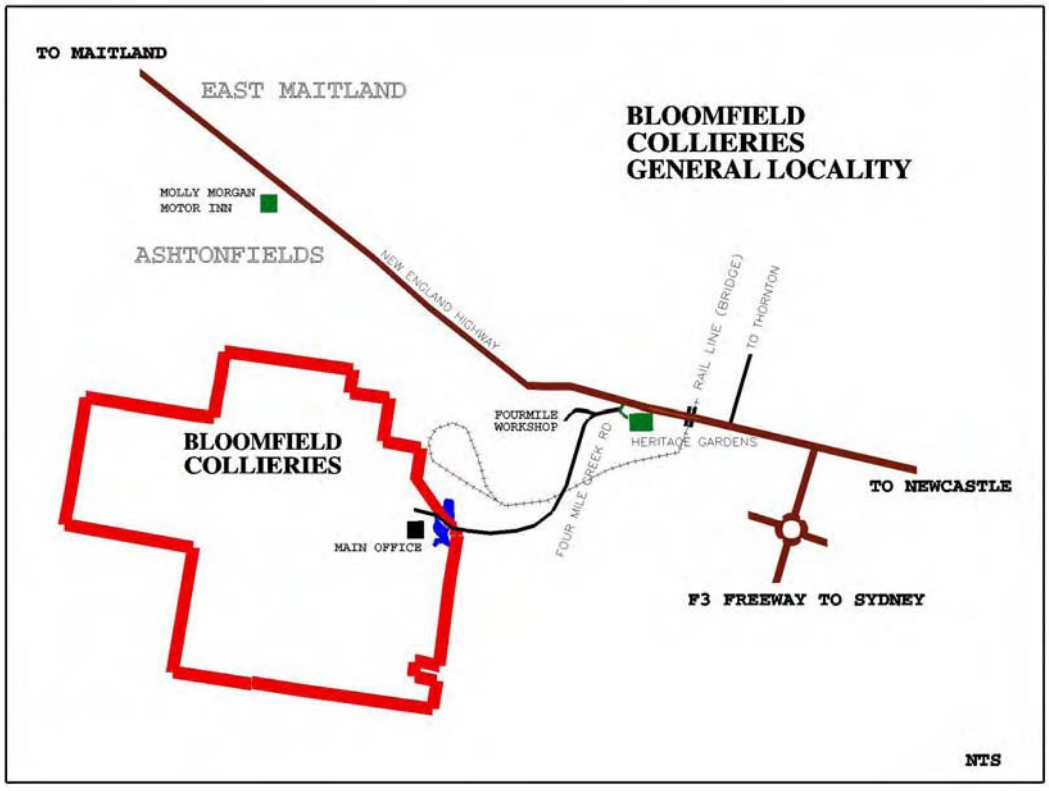

Figure 1: General Location of Study Area (top - Whereis, bottom - Bloomfield Collieries).

Figure 2: Topographic Context of Study Area (Beresfield 9232-3N MGA 1:25,000 topographic map, reduced).

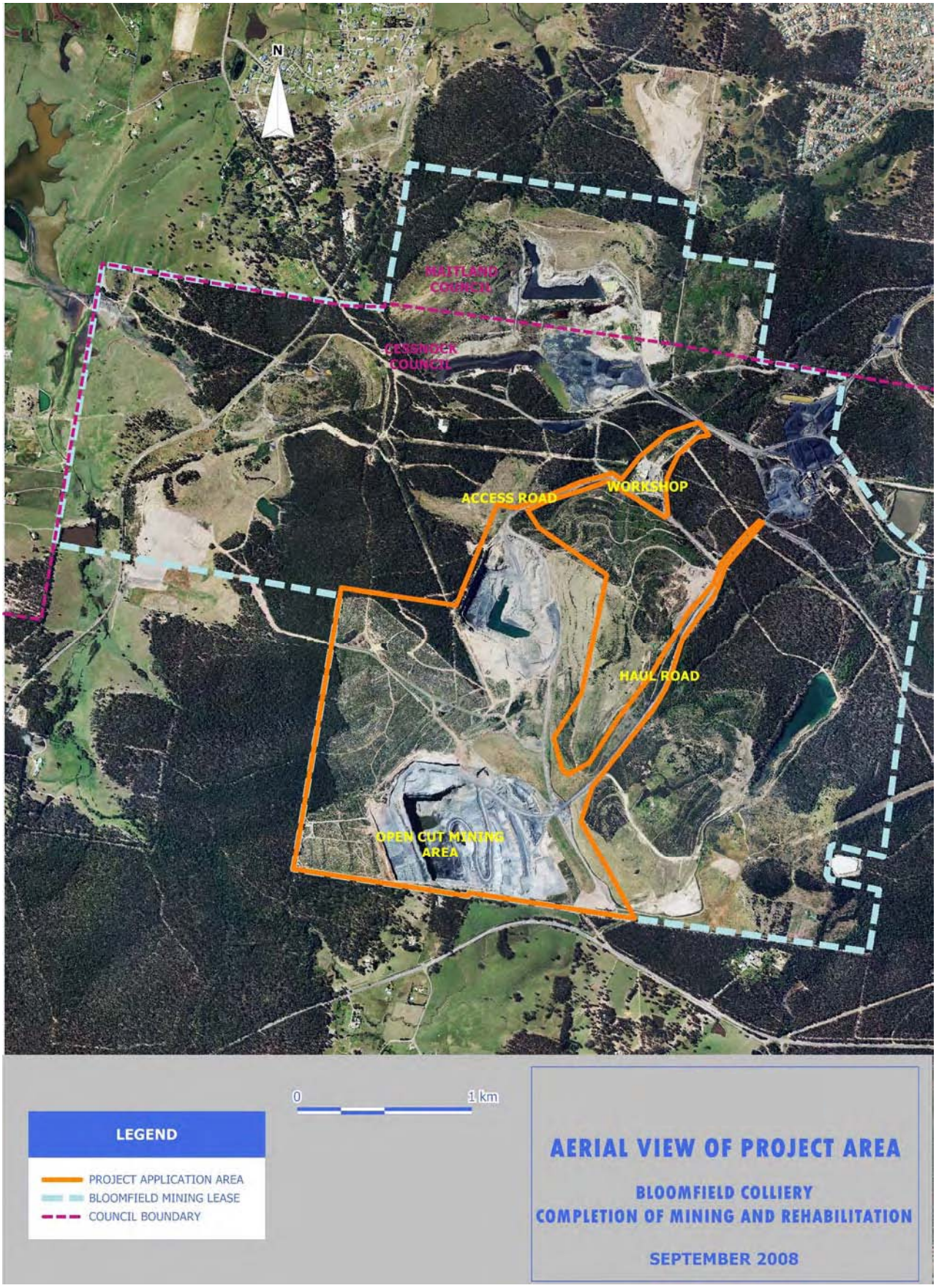

Figure 3: Aerial Photograph of Study Area.

2. ENVIRONMENTAL CONTEXT

The study area is marked on Figures 2 and 3. It is located between five and eight kilometres southwest of the East Maitland Post Office and 25 kilometres northwest of Newcastle, in the Lower Hunter Valley of New South Wales. The study area measures approximately 318 hectares in area and lies within Consolidated Coal Lease 761 (CCL761), which measures a total of 1,470 hectares (Figure 3). The land within CCL761 is owned by Ashtonfields Pty Ltd, except Lots 35 and 36 DP 755237, which are owned by Four Mile Pty Ltd.

The study area is primarily located within the southwestern portion of CCL761 and includes (Figures 2 and 3):

- The active-areas of open cut mining known as the "S-Cut" and "Creek Cut" (Plates 3 and 5);
- The haul road from the active mining area (S-Cut) to the washery ROM coal stockpile pad (Plate 2);
- The workshop area and access road to the workshop from the Creek Cut (Plate 1); and
- The yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut (Plates 6-21).

Hence, approximately 210 hectares of the study area comprises land that has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive. These areas (Plates 1-3 and 5) are marked as "modified" on Figure 4. The Aboriginal heritage investigation has subsequently focused on the remaining "unmodified area" (land yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut) in which there remains some potential for heritage evidence (Plates 6-21). This area measures 108 hectares and is marked on Figure 4.

The study area is located within the Central Lowlands region of the lower Hunter Valley. It is situated within the East Maitland Hills sub-region defined by Matthei (1995), comprising undulating low hills and rises. The northern portion of the unmodified area is dominated by a major ridge crest and its associated moderately inclined slopes, spur crests and first and second order drainage depressions, including on the northern side headwater tributaries of Elwells Creek, itself a tributary of Four Mile Creek to the northeast (Figure 2). The southern portion of the unmodified area is dominated by a broad gentle spur crest and first and second order tributaries of the headwaters of Buttai Creek, itself a tributary of Wallis Creek to the northwest (Figure 2).

The slopes are largely of moderate gradient (>5.45º), with this category (defined after McDonald *et al* 1984) comprising 48% of the unmodified study area (refer to Table 1 and Figure 4). Areas of gentle gradient (1.45-5.45º) comprise 34% of the unmodified study area and areas of level or very gentle gradient (<1.45º) 18% of the unmodified study area.

Landform units present within the study area include simple slopes, drainage depressions, ridge crests and spur crests (Table 1). The ridge crests form the greatest proportion of the unmodified study area (32%), with simple slopes comprising 31%, spur crests 19% and drainage depressions 18%.

The underlying geology of the study area comprises shale, mudstone, sandstone, tuff and coal of the Permian Era Tomago Coal Measures (Newcastle SI-56-2 1:250,000 geological map). Minor sandstone bedrock is exposed within the study area. Sandstone and sedimentary gravel is common, with minor quantities of small quartz, silcrete and tuff gravel in a few locations. Soils are predominantly of the Shamrock Hill type (Matthei 1995).

The area that is proposed to be mined (ie. the unmodified study area) was cleared of vegetation in early 2004 (Figure 3, Plates 6-21). Grasses and low vegetation have been allowed to regenerate to stabilize the surface until it is required for mining. On the western margin of the study area, a heavily harvested forest predominantly consisting of Spotted Gum (*Eucalyptus maculata*) and Ironbark (*E. fibrosa* and *E.paniculata*), with an understorey of Paperbarks (eg. *Melaleuca nodosa*), Wattles (eg. *Acacia falcata*) and Blackthorn (*Bursaria spinosa*) and ground cover of grass is present.

Historical records indicate that there has been a long period (approximately 180 years) of non-indigenous use of the study area, including for timber harvesting, coal extraction and pastoral use. The Hunter region was identified by Lieutenant John Shortland of HMS Reliance on 16 September 1797. Free selecting of land commenced on a small scale on the Hunter River in 1821 or 1822. Timber getting was an important industry from the initial non-indigenous settlement and by 1815 had reached considerable proportions. Coal mining was also one of the first industries in the valley, commencing in 1798. The Brown brothers started a coal mine in 1844 at Four Mile Creek, adjacent to the present study area (Windross & Ralston 1897:46). The current owners purchased the Bloomfield Colliery mining lease in 1937. Underground mining has, at various times, worked the Donaldson, Big Ben and Rathluba Seams at Bloomfield, until ceasing in 1992. In 1962, a small open cut operation commenced. The open cut has continued to expand and develop with the introduction of new machinery and technology.

Recent, non-Aboriginal land-use practices have extensively affected the study area (Plates 1-21). Approximately 210 hectares (66%) of the total study area has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive ("modified" on Figure 4, refer also to Plates 1-3 and 5). These works include the active-areas of open cut mining known as the "S-Cut" and "Creek Cut" and adjacent rehabilitated backfill, the haul road from the S-Cut to the washery and the workshop area and access road to the workshop from the Creek Cut.

The remainder of the study area (herein referred to as the "unmodified study area") comprises land yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut, in which there remains some potential for heritage evidence (Figure 4, Plates 6-21). This area measures 108 hectares and comprises 34% of the study area. However, extensive recent impacts have occurred across almost this entire area. The principal impact has been from the removal of the forest vegetation in early 2004, by earthmoving equipment. This process has extensively impacted the A unit soil (in which stone artefacts could be expected to occur), often totally removing it or covering it with B unit clay (culturally sterile). Large windrows of vegetation are present. Other impacts have arisen from dozer pushes, mine roads and other vehicle tracks, biosolid stockpiles, soil stockpiles, bark chip stockpiles, powerlines, pipelines, mine infrastructure such as water tanks and contour banks, along with erosion. These impacts are likely to have substantially reduced the integrity of any artefact evidence within the unmodified study area, and totally removed most other forms of heritage evidence (eg. scarred trees) had they been present.

3. ABORIGINAL ARCHAEOLOGICAL CONTEXT

3.1 Heritage Register Searches

A search was undertaken of the Department of Environment and Climate Change (DECC[1]) Aboriginal Heritage Information Management System (AHIMS) of a 238 square kilometre zone encompassing the study area. Within this zone, artefact scatters and isolated artefacts are the most frequently occurring Aboriginal site types previously recorded. Several grinding groove sites and a scarred tree have also been recorded. However, no Aboriginal heritage sites have previously been recorded within the study area.

No Aboriginal heritage sites are listed on the State Heritage Register, Register of the National Estate, National Heritage List or Commonwealth Heritage List or on the *Cessnock Local Environmental Plan* (LEP) *1989*, the *Hunter Regional Environmental Plan 1989 (Heritage)* or under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or the *Environment Protection and Biodiversity Conservation Act 1999* within the study area.

3.2 Previous Archaeological Research

A number of archaeological surveys and excavations have been conducted within the locality and within the wider lower Hunter region, in a commercial contracting framework. 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.

Locality South of Maitland:

In the vicinity of the study area around Maitland, numerous surveys and several excavations have been conducted, typically in relation to residential and industrial developments. Many of these investigations have been within landform units in the East Maitland Hills, including areas fringing the wetlands and Hunter River floodplain. Typically small and often low-density artefact scatter sites have been identified, but only where exposed by erosion, disturbance or deliberate excavation. However, minimal broad area excavation of any Aboriginal sites has been undertaken to permit adequate assessment of the nature of the activities represented by this evidence.

Immediately east of the present study area, a number of investigations have been undertaken into the Donaldson Coal Mine.

Brayshaw (1985) initially located two artefact scatters close to Four Mile Creek, during a survey for the then proposed 'Ironbark Colliery'. The sites are located near the junction of John Renshaw Drive and Black Hill Road, in the Donaldson Mine area east of the present study area. 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 metre area, 20 metres from the creek.

[1] The Department of Environment and Climate Change (DECC) changed its name from the Department of Environment and Conservation (DEC) in April 2007. Previously, DEC was known as the National Parks and Wildlife Service (NPWS).

Effenberger (1997) investigated the 546 hectare Donaldson Exploration Lease (EL5071) with a sample survey and located eleven heritage sites. With the exception of one large artefact scatter (WF1, over 100 artefacts on a rise adjacent to a floodplain) and a possible scarred tree, the sites comprise small artefact scatters (less than five artefacts) or isolated artefacts.

Umwelt (1998a, 1998b) conducted further investigation with the Donaldson Lease Area to address issues raised by the National Parks and Wildlife Service (NPWS) with the original Effenberger (1997) assessment. Additional predictive modelling and surveying was undertaken, only to result in the location of one further isolated artefact. Umwelt (2000) then prepared an Aboriginal Sites Management Plan for the Coal Mine to cover the first year of mine operations. In response to additional concerns raised by the NPWS, Umwelt (2001b) undertook further survey of the mine area, identifying three more isolated artefacts.

Also in the same year, Umwelt (2001c) surveyed for seven days two major conservation areas located in the Donaldson Lease Area. These areas, known as 'Bushland Area 1' and 'Bushland Area 2' total 956 hectares in size. An additional eight Aboriginal sites to those previously recorded were identified in the Bushland Conservation Areas. These were almost all isolated artefacts, with the exception of one small artefact scatter. All of the evidence was moved by Umwelt (2001c) to perceived safer locations. Ongoing investigations at Donaldson Mine by Umwelt have included monitoring of selected 'Datum Points'. During one inspection in 2002, two additional isolated artefacts were recorded.

More recently, Kuskie (2006) assessed additional areas within Donaldson Mine and Bloomfield Colliery for Donaldson's Project Abel Part 3A application. The investigation area for the Abel Underground Mine consisted of the underground mining lease of approximately 2,750 hectares south of John Renshaw Drive (the 'southern investigation area') and the area north of John Renshaw Drive that will be used for surface facilities, primarily within the existing Donaldson open cut mine but also including a portion of the Bloomfield lease area (the 'northern investigation area'). This area included a broad corridor extending northwest from John Renshaw Drive to adjacent to the Bloomfield workshop area presently under investigation and northeast to the rail loop. Kuskie (2006) located two grinding groove sites near Black Hill, south of John Renshaw Drive, two small artefact scatter site loci (F1/A and F2/A) and two isolated artefact loci (F1/B and F1/C) south of John Renshaw Drive, and ten small artefact scatter/isolated artefact site loci (A7/A, A15/A, A17/A, A17/B, A17/C, A20/A, A20/B, A20/C, A21/A and A22/A) in the Donaldson and Bloomfield lease areas north of John Renshaw Drive. One of these site loci, A7/A (DECC #38-4-1012), lies 100-200 metres east of the workshop portion of the present study area. It comprised a single artefact, a tuff flake, located on a gentle spur crest adjacent to the above-ground water pipeline.

Umwelt (2002c) investigated proposed road works along John Renshaw Drive including immediately south of the present study area, and west to Stanford Merthyr. This followed an earlier investigation by ERM (1998). Three artefact scatter sites and one isolated artefact were identified on crests and slopes along John Renshaw Drive. One site (#38-4-687) is located 500 metres southeast of the present study area.

Barber (Resource Planning 1992b) surveyed a 70 hectare property at East Maitland, several kilometres northeast of the present study area. 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 close proximity to a watercourse and the artefacts were predominantly red silcrete flake portions and flaked pieces. The artefacts appeared to be eroding from sub-surface deposits.

Dallas (1996) surveyed the nearby 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. Test excavations by ERM (2001) at the nearby Waterforde Estate Stages 2-3, involving 25 1 x 1 metre units, resulted in the identification of a very low number of artefacts. A similar result was obtained from the Waterforde Estate Stage 4 (ERM 2002a).

Dean-Jones (1989) investigated the 60 hectare 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. It is located several kilometres north of the present study area. Low gradient simple slopes and minor intermittent watercourses were present. Five artefact scatters, containing between two 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 stone 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 was interpreted as being a place for the procurement of potable water after rain, in addition to other, unspecified purposes.

Ruig (1993) 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, including one on the water pipeline about one kilometre east of the haul road section of the present study area.

Ruig (1992) investigated proposed extensions to the Benwerrin Colliery, near Buttai, southwest of the present study area. A 3.5 hectare area on a sandstone ridge, adjacent to the western boundary of the existing mine pit was surveyed. No Aboriginal heritage evidence was 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 (1994) 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. Umwelt (2003, in prep.) conducted further investigations of the F3 to Branxton link. Aboriginal sites recorded included three stone arrangements, four artefact scatters, an isolated artefact and a grinding groove site.

Elsewhere in the East Maitland locality, several of the earliest sites were identified by Enright (1911, 1931, 1936). Enright (1911) reports on the discovery of stone artefacts on alluvial banks of the Hunter River, including an axe found at a depth of 3-4 metres at the Maitland Colliery Shaft, near West Maitland. Enright (1931) also reports on another ground-edge axe collected from a property at Tarro.

Beresfield and Western Margin of Hexham Swamp:

East and southeast of the present study area, around Beresfield and the western margin of Hexham Swamp, a number of archaeological studies have been completed, the results of which are relevant to the present investigation.

Kuskie (2005a) reinvestigated Lot 23 DP 532814 and Lot 226, an area of approximately 90 hectares south-west of the junction of Weakleys Drive and the New England Highway at Beresfield, for the proposed Freeway North Business Park. The study area was subdivided and inspected within 17 environmentally discrete survey areas. The total survey coverage equated to approximately 2.9% of the study area. The total effective survey coverage equated to around 0.4% of the study area. Visibility tended to be relatively high on a number of vehicle tracks that traverse the area and low elsewhere in the regrowth forest.

A total of 18 Aboriginal heritage sites, all stone artefact occurrences, were recorded, with a total of 178 stone artefacts (Kuskie 2005a). These items are dominated by silcrete (87% of the assemblage), with a lower frequency of volcanic tuff (12%) and a single quartz artefact. The artefacts almost entirely comprise items associated with non-specific knapping, including flakes (38% of the artefact assemblage), cores and core fragments (7%) and flake portions (51%). One microblade core was identified and six retouched flakes (3% of the assemblage).

Kuskie (2005a) inferred that Aboriginal occupation of the study area was widespread, but typically of a low intensity, possibly in relation to the procurement of food (hunting, gathering) or transitory movement through the landscape. The study area was assessed as comprising two distinct zones, in terms of the nature of soil deposits and the potential for further heritage evidence to occur (Kuskie 2005a):

A) Moderate to highly disturbed and typically elevated, erosional landform units, which with their shallow A unit soils and levels of ground disturbance, along with their inferred use for low intensity activities (producing evidence consistent with 'background discard') have a low potential for sub-surface deposits, particularly deposits that may be *in situ* and/or of research value; and

B) Higher order watercourses and associated flats of Scotch Dairy Creek and Weakleys Flat Creek/Viney Creek, along with the basal slope portions of survey areas W15 and W23, with deeper soil deposits and potentially more focused activity such as encampments having occurred, in which there remains a high potential for further heritage evidence to occur in the form of artefact deposits, including deposits of sufficient integrity to be of research value.

Sites W15/B, W15/C, W15/D, W15/E, W15/F, W18/A, W20/A, W20/B, W21/A, W22/A, W23/A, W23/B, W23/C and W23/D were assessed as being of low archaeological significance within a local context. Sites W15/A, W15/G, W23/E and W23/F were assessed as being of potentially moderate scientific significance within a local context (Kuskie 2005a). The primary recommendations arising from the investigation of Kuskie (2005a) were that several conservation zones should be established along the main watercourses, with Section 90 Consent sought for the remainder of the property, potentially involving salvage collections by the Aboriginal community.

Kuskie (2004d) investigated an area immediately to the south of the proposed Freeway North Business Park for a proposed Stage 3 extension to the Freeway Business Park. The study area comprised Lot 225 DP 1054242, an area of approximately 40 hectares west of the existing Freeway Business Park and Weakleys Drive and north of John Renshaw Drive. The area was subdivided and inspected within nine environmentally discrete survey areas. The total survey coverage equated to approximately 5.5% of the study area and the total effective survey coverage 0.7% of the study area. Visibility tended to be relatively high on a number of vehicle tracks that traversed the area and low elsewhere in the regrowth forest.

A total of eleven Aboriginal heritage sites and 23 stone artefacts were recorded (Kuskie 2004d). The artefacts are dominated by silcrete (91% of the assemblage), with a lower frequency of volcanic tuff (9%). The artefacts entirely comprise items associated with non-specific knapping, including flakes (43% of the artefact assemblage), cores and core fragments (30%) and flake portions (26%). Aboriginal occupation of the study area is inferred to have been widespread, but typically of a low intensity, possibly in relation to the procurement of food (hunting, gathering) or transitory movement through the landscape. More focused occupation, such as short-term temporary encampments, may have occurred on the flats bordering Viney Creek (Kuskie 2004d).

Kuskie (2004d) concluded that the study area essentially comprised two distinct zones, in terms of the nature of soil deposits and the potential for further heritage evidence to occur:

A) Moderate to highly disturbed and typically elevated, erosional landform units, which with their shallow A unit soils and levels of ground disturbance, along with their inferred use for low intensity activities (producing evidence consistent with 'background discard') have a low potential for sub-surface deposits, particularly deposits that may be *in situ* and/or of research value; and

B) The higher order watercourse of Viney Creek and its associated flats (survey area W3), with deeper soil deposits and potentially more focused activity such as encampments having occurred, in which there remains a high potential for further heritage evidence to occur in the form of artefact deposits, including deposits of sufficient integrity to be of research value.

Sites W1/A, W1/B, W1/C, W1/D, #38-4-621, W2/A, W4/A, W4/B, W4/C and W7/A were assessed as being of low archaeological significance within a local context. Site W3/A (#38-4-554) along Viney Creek was assessed as being of potentially moderate scientific significance within a local context. Although the development design had not been finalised, the primary recommendations of Kuskie (2004d) were that a conservation zone should be established along the main watercourse encompassing site W3/A, with Section 90 Consent sought for the remainder of the property, potentially involving salvage collections by the Aboriginal community.

Umwelt (Australia) (2001) undertook test excavations at the proposed Freeway Industrial Estate, a 46 hectare property bounded by Weakleys Drive, John Renshaw Drive, Viney Creek and Weakleys Flat Creek. The report relied extensively on the research and investigations of Kuskie and Kamminga (2000), immediately to the south at Woods Gully and Black Hill. Umwelt (2001) excavated nine auger holes in each of 23 locations to test the different landscape units within the study area. Only 81 artefacts were identified, although the total volume of deposit excavated was relatively small. Trenches, each measuring 10 m^2 in area, were excavated on the Weakleys Flat Creek floodplain, the Viney Creek floodplain and the lower slope adjacent to the Weakleys Flat Creek floodplain. A total of 180 artefacts were retrieved. In combination with 77 artefacts recorded in surface scatters, a total of 338 artefacts were identified within the study area (Umwelt 2001). The combined assemblage was dominated by silcrete (81%) and typically comprised flake portions (42.9%), flakes (30.4%) and flaked pieces (22.4%).

Curran (ERM Mitchell McCotter 1995a, 1996a) investigated the Holmwood Industrial Estate, a 60 hectare property bordering the New England Highway, John Renshaw Drive and Weakleys Drive at Beresfield. Six sites were located, including site BS3 (#38-4-388) containing over 200 silcrete artefacts within a 400 x 300 metre area and site BS4 (#38-4-380 & #38-4-389), an artefact scatter with over 100 siliceous artefacts. 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 metre intervals along six transects. The transects predominantly sampled the drainage line and slope landform units. Seventy-four 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).

Additional surveys by Nightingale (ERM Mitchell McCotter 1996b), Kuskie (1992a, 1992b, 1993a, 1993b) and others in the Beresfield and Black Hill locality have resulted in the location of small artefact scatter sites or no evidence at all.

Glenn Atkinson, of the Soil Conservation Service, recorded an artefact site near the 'Glenrowan' homestead, on the northern margin of Hexham Swamp. The site (#38-4-358) consisted of numerous stone artefacts on the eroded face of an Early Holocene age fore-dune bordering Hexham Wetlands. Atkinson described the soil as being early or mid-Holocene in age.

Silcox (1998) surveyed a 25 hectare property for the proposed 'Beresfield Park Industrial Estate'. The study area is bordered by Weakleys Flat Drive and Weakleys Flat Creek, and the adjacent Holmwood Business Park. No evidence was identified during the survey, a result attributed to low conditions of surface visibility. A program of sub-surface testing was recommended in one area of high archaeological potential. Silcox (1999) excavated ten trenches by backhoe, at 20 metre intervals on two parallel transects. A total of 42 artefacts were recovered, almost all silcrete flake fragments, flakes and flaked pieces. Silcox (1999) concluded that the location was not the most suitable for camping, because it was not well drained and the evidence was not indicative of activities relating to camping.

Kuskie (1997) surveyed a 130 hectare property largely owned by Newcastle City Council at the corner of Lenaghans Drive and John Renshaw Drive (Kuskie 1997). 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 were located within the property. The total survey coverage amounted to approximately 4.6% of the property. However, vegetation cover reduced the effective survey coverage sample to 0.4%.

Kuskie (1997) concluded that there was a moderate or high potential for artefact scatter sites to occur on most landform units within the property. A low density scatter of artefacts was considered to be potentially present across virtually the entire elevated portion of the property, with occasional areas of higher density representing specific activities (eg. stone tool reduction) or focused occupation (eg. camping) (Kuskie 1997).

Kuskie (2002) reassessed a 19 hectare portion of the above property for a proposed rural/residential development. One small artefact scatter site was identified on spur crests of high potential fringing the wetlands.

Immediately south of this property, investigations of the 13 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, #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 (1995). 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 of test units were set out at seven locations. A total of 218 test units were excavated. The total potential site area was estimated at 7.7 hectares and a total area of 13.6 m^2 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 metres in area and dug to the top of the B unit soil at 0.23 - 0.35 metres depth. Deposits were wet sieved using 2 and 5 millimetre mesh (Silcox & Ruig 1995:24-25).

A total of 663 artefacts were recovered from the 218 test units. An additional 77 artefacts had previously been collected by members of the Awabakal Local Aboriginal Land Council. The excavated sample comprised 51.7% 'indurated mudstone' (tuff), 35.3% silcrete, 2.1% quartz, 1.8% acid volcanics, 1.8% fine grained basic volcanics, 1.2% chert, 1% quartzite and 5.1% of other stone materials. The sample included 190 whole flakes (105 tuff, 63 silcrete), 291 flake portions, 122 flaked pieces, 12 amorphous artefacts with retouch/use-wear (6 flakes, 6 broken flakes), 9 cores, 6 backed blades (4 complete, 2 fragments) and 26 pebble fragments and 7 other unspecified artefacts. 53.1% of artefacts were >10 millimetres in maximum dimension. Artefact density per square metre excavated averaged 48.7, and ranged from means of 3.2 to a relatively high 293.3 for each transect. A volume of 3.507 m^3 was excavated, with a mean artefact density of 190 per m^3 (Silcox & Ruig 1995:32).

Silcox and Ruig (1995:36) summarised their results as follows:

> "The test program 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 and Ruig (1995:38) predicted that archaeological material is likely to be distributed in a 'discontinuous scatter of variable density, in a sub-surface context (the upper 0.3 metres of the A unit soil) across the surfaces of the main ridge and at least two spur ridges'. Silcox and Ruig (1995) speculated that at locations L1, L2, L3 and L4 the evidence indicates possible higher artefact densities near the edge of the ridge crest (within 35 metres), 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 <10 mm (47%) was taken as evidence that stone-working, 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, its 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 metres was recommended for area L4 or L6, to encompass the exposed and potential artefact distribution and to allow for the investigation of spatial variability across the ridge surface.

Studies for the F3 Freeway on the Western Margin of Hexham Swamp

A series of archaeological investigations have been undertaken along the route of the F3 Freeway between Minmi and John Renshaw Drive (Resource Planning 1992a, Effenberger 1995, Effenberger & Baker 1996, Kuskie & Kamminga 2000).

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). Curran (Resource Planning 1992a:8) located one isolated artefact and one small artefact scatter, both along Option AO3. Effenberger (1995) was engaged by the RTA 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. Several artefacts were located, but low surface visibility elsewhere prevented the identification of any further evidence.

Following requests from the Mindaribba LALC and NPWS, 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 and Baker (1996). 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 metre intervals. The C3 zone was sampled in a more limited manner (40 metre 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 m^2 at F5 and 8 m^2 at F4 (Baker 1996).

Baker (1996:13-14) identified artefacts 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/m^2 respectively, while at F5 artefact density averaged 5/m^2. 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 argued his results contradict the model that archaeological sites are associated with watercourses (typically within thirty metres).

Baker concluded 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/conflated m^2) was identified by Baker (1996:15-16) across most of the area. The hand excavation at Woods Gully revealed the then 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 stone material and 'indurated mudstone' (tuff) 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 occurred where they were manufactured (associated with debitage of the same stone material and appearance) and were broken or incomplete. Several exhibited use-wear. Microblade debitage occurred across all areas but at varying densities. Other debitage included 'expediently produced flakes and fragments thereof which did not show any distinctive signs of any specialised reduction strategy' (Baker 1996:20). Baker (1996:21-22) argued that evidence for specialised strategies associated with the manufacture of backed blades and heat treatment of silcrete was present. Baker (1996) argued that at Woods Gully, large-scale and intensive silcrete processing and backed blade production occurred, which differentiates this site from the others. Sixty-six backed blades (including whole, broken and unfinished specimens) and manufacturing debitage were recovered from the 4.25m^2 broad area excavation.

Baker (1996:24-25) concluded 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 was noted, apart from the heat treatment and intensive backed blade manufacturing area. Baker suggested 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 argued 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 LALC 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 2000).

The fourteen week excavation program comprised an initial phase of testing, a second phase of broad area excavations and a third phase of mechanical surface scrapes. A total of 612 small test units were excavated in the first phase, for a total area of 38.25 m^2. These units, measuring 0.25 x 0.25 metres in area, were excavated three metres apart on a rectangular grid across each site. The main objectives of identifying the basic pattern of artefact distribution, characterising the nature and variety of archaeological evidence and selecting locations for broader area excavation were achieved (Kuskie & Kamminga 2000).

In the second phase at each site, larger areas were excavated by shovel and trowel. At site Black Hill 2, a 7 m^2 area and a 56 m^2 area were excavated on the ridge crest. At Woods Gully, an 87 m^2 area was excavated adjacent to the watercourse, including a 39 m^2 narrow trench extending away from the creek up the hill-slope. Excavation of the broad areas in the second phase permitted almost all of the relevant research questions to be addressed (Kuskie & Kamminga 2000).

Following the controlled excavations, earthmoving machinery was used in the third phase of the salvage program to carefully remove the grass cover and upper centimetres of soil, to identify if other significant features (such as hearths or heat treatment pits) were present. Five surface scrapes were undertaken within the Freeway corridor at site Black Hill 2 and two at Woods Gully. After the surface had been scraped, personnel walked slowly across measured areas to identify and collect any cultural material present. The surface scrapes permitted identification of several diagnostic items and features that were not identified during the earlier phases. Several dense artefact concentrations were found at Black Hill 2 and subsequently salvaged by hand excavations totalling 8 m^2 in area (Kuskie & Kamminga 2000).

Within each of the hand excavations, deposit was excavated in 0.25 x 0.25 metre units in successive levels of five or ten centimetres depth. Each bucket of excavated deposit was labelled with provenance information and transported to a sieving station. The practice of 'total sieve retrieval' was employed for the first time on a major archaeological excavation in the Hunter Valley. This involved retention of all residue (cultural and natural material) in the sieve, which was then artificially dried and cultural items extracted by a qualified archaeologist in laboratory conditions. The process of total sieve retrieval has several significant advantages over traditional methods of sieving and artefact recovery, which involve (often untrained) personnel directly retrieving cultural items during sieving (Kuskie & Kamminga 2000).

An on-site lithic work-station was established, where every lithic item retrieved was examined under a low-magnification binocular microscope and identified and recorded in computer databases. This was the first instance of routine microscopic examination of lithic items from a large assemblage in the Hunter Valley. This procedure offered substantial benefits in terms of the accurate identification of stone material categories, artefact types and attributes, and the presence and nature of use-wear and residues (Kuskie & Kamminga 2000).

In total, an area of 196.25 m^2 was carefully excavated by hand. Surface scrapes with a combined area of 34,422 m^2 were undertaken. The excavations resulted in a total of 72.4 tonnes (64.6 cubic metres) of soil being dug by hand and wet-sieved. Through the hand excavations and surface scrapes, a total of 37,585 lithic items were identified and recorded. This assemblage comprised 22,921 identifiable Aboriginal artefacts and 14,664 items described as ‘lithic fragments’, which were lithic items that did not have sufficient morphological attributes to positively identify them as artefacts, even though many must be fragmentary debris from stone knapping (Kuskie & Kamminga 2000).

The mean density of artefacts per volume within the hand excavations equated to 546.2 artefacts/m^3 at Black Hill 2 and 209.5 artefacts/m^3 at Woods Gully. The density of artefacts varied widely within individual excavation unit spits (ranging from nil to 23,555 artefacts/m^3) (Kuskie & Kamminga 2000).

A total of 44 categories of stone artefacts were identified in the Black Hill 2 and Woods Gully assemblages. Six basic categories of activities were identified through the artefactual evidence at the sites: non-specific stone flaking, bipolar flaking, microblade production, backing retouch of microblades, loss or intentional discard of microliths and loss or intentional discard of non-microlith tools. However, many of the artefact categories represent debris from stone knapping, with production of microblades being the most common specific activity. Some of the microblades (and probably other flake types) were further knapped to make microliths, particularly bondi points. Artefact assemblages containing microblades and microlith knapping debitage are typical of prehistoric occupation sites in the lower Hunter Valley and south-eastern Australia generally (Kuskie & Kamminga 2000).

Replicative microblade and microlith knapping experiments were performed to determine the quantity of artefacts and debitage produced by such events and to provide baseline data for the interpretation of the Black Hill 2 - Woods Gully evidence. Examination of the ratios of microlith backing flakes produced by experimental manufacturing of tuff and silcrete bondi points indicates that possibly less than 150 bondi points were made on-site at broad area C3/B, and less than half that number at broad area F5/A (Kuskie & Kamminga 2000).

These results highlight the huge quantity of mostly small debitage produced by knapping microblades and microliths. Most of the lithic assemblages at the Black Hill 2 and Woods Gully sites derive from these activities, yet comparatively small numbers of the desired end products are the presumed result of all this evidence of activity. The apparent 'wastefulness' of the microblade and microlith manufacturing activities, or high costs of time and energy expended, is very significant. Kuskie and Kamminga (2000) postulate that considerable time and effort was expended on heat treating silcrete to improve knapping properties and perhaps produce symbolically significant (and aesthetically appealing) colours, knapping microblades and microliths (with minimal, if any, concern for conservation of stone) and arming spears with the end products (primarily bondi points). Alternative options were available to achieve more or less the same products and material outcomes for less expenditure of time and energy. Therefore Kuskie and Kamminga (2000) postulated that these activities occurred because a spear armed with stone barbs was an important component of a man's equipment and may have had considerable social value. In such circumstances, it is feasible that men would have invested time and energy in producing spear barbs, even transforming the colour of stone for reasons other than purely utilitarian ones.

The overall size characteristic of the artefact assemblages is that most items (89%) are small, measuring less than 20 mm in maximum dimension. In fact, the vast majority of artefacts (64.6% of the combined artefact total) measure less than 10 mm in size. This high proportion of very small artefacts is due to the abundance of microblade debitage and the use of 'total sieve retrieval' methodology (Kuskie and Kamminga 2000).

Seven different types of stone materials were identified in the excavated assemblages. However, the assemblages were overwhelmingly dominated by indurated rhyolitic tuff (70.45% of combined artefact assemblages) and to a lesser extent silcrete (20.4%), materials which were favoured for making microblades, microliths, eloueras and worimi cleavers in the Hunter Valley during recent millennia. Minor frequencies of other stone materials were present, such as quartz, chalcedony, chert, dacite and sandstone.

Microscopic inspection of specimens, thin-section analysis and x-ray diffraction analysis were critical in identifying stone materials and establishing that the stone type commonly referred to by archaeologists as 'indurated mudstone' is in fact indurated rhyolitic tuff (Kuskie and Kamminga 2000). It was inferred that in the lower Hunter Valley, much or nearly all of the stone used for knapping was probably derived from local sources within a day's foraging range of campsites.

There is considerable evidence to suggest that a proportion of the silcrete items in the lithic assemblage had been heat affected. Deliberate heat treatment was inferred for a large proportion of the silcrete assemblage, and for specific silcrete items. It is probable that heat treatment of silcrete occurred both at the Woods Gully and Black Hill 2 sites and at other localities in the surrounding area. Evidence of two possible heat treatment pits was identified at Black Hill 2. In Aboriginal society, colours had important symbolic meaning and part of the reason for heat treatment may have been to obtain desired colours as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears (Kuskie and Kamminga 2000).

An inventory of traditional Aboriginal material culture for the lower Hunter region was compiled. The material culture was examined to reconstruct the role of stone technology in its production and maintenance, and in procuring food.

Methods of spatial distribution analysis enabled the identification of a number of activity areas, despite the horizontal and vertical movement of artefacts caused by various agencies of post-depositional disturbance.

An episode of occupation associated with a stone-lined fireplace at Woods Gully was radiocarbon dated to 2,130±70 years Before Present (Beta-119475). The Woods Gully and Black Hill 2 sites are dominated by evidence of microblade and microlith technology, indicating a maximum possible age of about 4,000 years BP (Kuskie and Kamminga 2000).

The potential types of occupation relevant to the Black Hill 2 and Woods Gully sites were discussed. The evidence from these sites was interpreted in relation to the traditional lifestyle of the local Aboriginal people and the hypothesised occupation types. A model of occupation for the locality consistent with historical, ethnographical and archaeological evidence was proposed, and is accompanied by a description of the types of archaeological evidence expected. Models of occupation presented by other researchers were reassessed, in relation to the evidence recovered from the Black Hill 2 and Woods Gully sites. The Black Hill 2 and Woods Gully sites probably represent evidence of one or more nuclear or extended family base camps, involving low numbers of people and several episodes of short-term occupation (Kuskie and Kamminga 2000).

The model of occupation proposed by Kuskie and Kamminga (2000) for the Black Hill - Woods Gully - Hexham Wetlands locality involves the following elements:

- Occupation by members of the Pambalong clan and possibly other clans of the Awabakal people;
- Occupation focused on the resource rich wetlands, swamps, lakes, estuaries and coastline of the tribal territory, possibly more so near the junction of multiple resource zones;
- Occupation predominantly within the past 4,000 years, after climatic change and rising sea-levels transformed the environment of the region, although occupation may have extended as far back as 30,000 to 40,000 years. However, few landscape contexts exist in which archaeological evidence of older occupation would be conserved;

- Occupation extending over the entire region, but at varying intensities and at different times of the year and different periods within the overall time-span of occupation. Some resources and therefore localities may have been occupied on a seasonal basis (perhaps in relation to the availability of food resources), however it is difficult to demonstrate in the archaeological record;

- Occupation reflecting a wide range of purposes, including transitory movement, hunting, gathering, procurement of stone, heat treatment of stone, camping by small parties of hunters, camping by small parties of gatherers, nuclear family base camps, community base camps, camping by larger congregations of groups, ceremonial or spiritual activity and burial practices;

- Activities such as food procurement (hunting, gathering and land management practices such as burning off), food processing, food consumption, maintenance of wooden and stone tools, production of stone tools (including systematic production of types such as bondi points, and casual, opportunistic production of other items on an as needed basis), production of wooden tools and other implements, procurement of stone, heat treatment of stone, erection of shelters, children's play, ceremonial activity, spiritual activity and social and political activity are among the types of pursuits engaged in by the local Aboriginal people;

- Activities varied in frequency and occurrence within the landscape (and between the different occupation site types), possibly in relation to numerous variables such as topography, distance to resource zones, distance to water, aspect, slope, cultural choice, etc. However, few activities are likely to be evident within the archaeological record other than those involving the use of stone or where preservation conditions permit, the consumption of food and use of bone, shell, wood and other organic materials. The majority of evidence within an archaeological context will relate to either general knapping of stone or production of microblades and microliths, but some evidence will exist of encampments, food processing, food procurement, and ceremonial and other activities;

- The stone materials indurated rhyolitic tuff and silcrete were favoured for stone-working activities. Tuff was favoured over silcrete for knapping and producing tools. Tuff was primarily procured from exposed bedrock in hills, along drainage depressions and along the coastline where this rock type exists. It is available in many locations due to its abundance in the local coal measures. Silcrete was also procured from local sources (alluvial and terrace gravels), but was not as readily available as tuff and was not used as frequently. Supplies of both types of stone were probably obtained during the course of normal daily and seasonal movements, without the need for special purpose trips. Conservation of these stone types was not a priority;

- Minimal use was made of other stone materials. Several of those that were utilised (quartz, quartzite, acidic volcanics, chalcedony and chert) were probably obtained from local sources such as alluvial and terrace gravels, terrestrial outcrops and weathered conglomerate rock. However, other types such as dacite and rhyodacite (used for grindstones) may have been obtained from sources on the coast north of Newcastle (around Birubi Point) by either trade or special exchange with another cultural group (in recent times the Worimi people), special purpose trips, or visits during the normal seasonal round;

- Ochre was used for ceremonial purposes and may have been procured from sources near Lake Macquarie, the Hunter River or from outside the region;

- Heat treatment of silcrete was undertaken to improve flaking qualities and possibly to obtain desired colours. Heat treatment involved both cobbles and large primary flakes of silcrete. Tuff was not deliberately heat treated. A reasonably high proportion of silcrete used in knapping was treated, and some of the products include bondi points that were hafted to spear heads. It is speculated that colours had important symbolic meaning in Aboriginal society, and part of the reason for heat treatment may have been to obtain a desired colour as well as to improve the flaking properties of the stone. This may have been especially important for armatures of fighting and hunting spears;

- Microblade production occurred widely, with the primary goal of producing microliths (eg. bondi points) that could be hafted onto hunting or fighting spears made of grass tree stems or other wood, with the use of resin. It was more likely to be a planned and organised activity, but it did not necessarily occur only at nuclear family base camps or hunting party camps. Microblade production may also have occurred in places traversed during the course of hunting expeditions, such as resting places along travel corridors. When the production of microblades occurred away from camps, it may have involved more casual or opportunistic behaviour, such as backing a microblade to replace a spear barb when needed;

- Some microblades and flakes were used as expedient, disposable tools for light-duty wood-scraping tasks, probably associated with spear manufacture and maintenance;

- Production of microliths was time-consuming and resulted in a considerable quantity of stone debitage at localities where it was undertaken. It is speculated that the end purpose (hunting or fighting spears armed with stone barbs) must have been highly desirable and socially valuable. Hunting larger animals with spears was also a high-risk subsistence activity, whereas most dietary requirements could be adequately met through low-risk means. Global scale analyses have demonstrated that in lower latitudes (in which the Hunter Valley is situated), with longer plant-growing seasons, plants and small land fauna are prominent in the economy of hunter-gatherer people (*cf*. Binford 1980, Torrence 1983). It is postulated that the investment of considerable time and energy in heat treatment of silcrete and production and hafting of microliths to hunting and fighting spears may have been undertaken more in relation to the social value of this item, rather than utilitarian need;

- Casual and opportunistic knapping or selection of flakes to meet requirements on an 'as needed' basis was a widespread occurrence. Suitable flakes (sometimes after being retouched) were used in domestic tasks such as fashioning or repairing a wooden implement, while a higher proportion of knapping products were simply discarded at the site of their manufacture, without use;

- A low frequency of items were knapped using the bipolar method, in which the nucleus is rested on a hard stone surface and struck with a hammerstone from above. Small hammerstones and retouchers were curated and rarely discarded on-site;

- Plant foods were processed and consumed at temporary hunters or gatherers camps, at family base camps, campsites of larger congregations of people and at the site of procurement. A range of plant resources were available in the locality. Women played a much larger role than men in obtaining and processing plant foods. Macrozamia kernels were collected on the ridges and slopes within a day's walk of the campsites, and prepared by a special process to remove toxins. This involved soaking the kernels for up to two weeks, then pounding and roasting them (*cf*. David 1890, Backhouse in Gunson 1974). This activity may have occurred at camping places around the margins of Hexham Wetland and other swamps;

- Ferns may have been a staple of the local diet, along with the bulbs and roots of other wetland plants. It is uncertain if swamp fern (*Blechnum* spp.) and/or bracken fern (*Pteridum esculentum*) was consumed. Notwithstanding its importance in the Maori diet, bracken fern, which grows in wet sclerophyll forest, is less likely since it is not reported ethnohistorically as being a preferred food (Gott, *pers. comm*.). Worimi cleavers were used to pound the starch-rich rhizomes of bracken fern and/or swamp fern and possibly the roots of other plants obtained from the wetlands (*cf*. Kamminga 1974). Eloueras may have been used for extracting the perennial herb cumbungi (*Typha australis*), abundant in the freshwater parts of wetlands, or less likely tall spike rush (*Eleocharis sphacelata*). Fibre from the cumbungi rhizome and leaf was used for string, baskets and nets (Gott, *pers. comm*.);

- Special tools such as worimi cleavers and grindstones were large and heavy and may have been deliberately cached at base camps in readiness for return visits;

- Animal foods were processed and consumed at temporary hunters or gatherers camps, at nuclear base camps, campsites of larger congregations of people and at the site of procurement. Men hunted for larger game, while women played a key role in obtaining smaller game. Hunting was a planned and coordinated event, as evidenced by the capture of kangaroos 'enclosed in a nook or bend in the river or some other obstacle' (Dawson 1830:119) and the use of fire to burn-off and promote fresh grass growth (Sokoloff 1978a-b);

- Fish were obtained by several methods. People used bark canoes on lakes, wetlands and rivers, and angled with shell fish-hooks and line. Fish were also obtained directly by spearing, while standing in a canoe or on a bank, or by the use of hand nets to form a circle in shallow waters and enclose the fish. Another group activity was the planting of sprigs of bushes in streams, with some men frightening the fish towards an opening, at which point others stood ready with nets to catch them (*cf*. Threlkeld in Gunson 1974). Eels were also caught in an organised manner, with small trenches being dug in the swamps, particularly near the narrower outlet (*cf*. David and Etheridge 1890:46). Managing resources by the use of facilities (eg. fish and eel traps) and fire (encourages new grass to attract kangaroos or manage macrozamias) were additional strategies aimed at increasing the reliability and productivity of food resources (Rich 1995:4);

- Birds such as swans and ducks were caught around the swamps and lakes (*cf*. Threlkeld in Gunson 1974).

- Nuclear family base camps may have tended to be well placed in relation to food resources, at the conjunction of two or more subsistence zones, close to potable water, and on level or very gently inclined ground. Visual aspect and security may have also been important considerations. The site occupants may have foraged within an area of up to ten kilometres radius from the campsite. Campsites in more favourable locations may have been the subject of stays of longer duration and more episodes of occupation; and

- Community base camps or camps of larger congregations of people may have tended to be situated on level ground adjacent to plentiful food resources and potable water (eg. terrace or flats near a river or wetlands) (Kuskie & Kamminga 2000:559-564).

The proposed model of occupation primarily relates to the last 2,000 years, after Hexham Wetlands had transformed to its present state. In the 2,000 years prior to this, saline estuarine conditions were transforming to brackish and freshwater swamps, resulting in different environmental conditions and variations to the model postulated above. It is again emphasised that although the model has been derived from archaeological, ethnographic, ethnohistorical and anthropological information, this data is generally scant and subject to biases and other constraints. Therefore, the proposed model is highly inferential in nature and elements may be refuted, amended or added after further studies (Kuskie & Kamminga 2000:564). For future testing of the proposed model, Kuskie and Kamminga (2000) presented the range of evidence that could be expected to occur within an archaeological context in relation to each behaviour/activity.

Thornton Locality:

Numerous investigations have been undertaken at Thornton, several kilometres northeast of the present study area.

Some of these have involved locations in the East Maitland Hills terrain back from the margins of the wetlands/former Hunter River estuary. Many of these investigations have identified small artefact scatter sites or no evidence at all (eg. Resource Planning 1993a, 1993b, 1994, ERM 2002b, 2002c, HLA-Envirosciences Pty Ltd 1995, Dagg 1996, Dean-Jones 1986, Kuskie 2004b, Brayshaw 1984).

Other investigations have occurred on the margins of the wetlands/former Hunter River estuary, and have typically identified larger and higher density artefact scatter sites, often through sub-surface excavations.

Rheinberger (Umwelt 1999a) conducted test excavations within a 12 hectare property proposed for a light industrial estate on the eastern side of Thornton Road. The property comprises simple slopes and a spur crest, descending to the adjacent Woodberry Swamp. Fifty-five units measuring about 2 x 0.5 metres and up to 0.4 metres deep were excavated by backhoe at 20 metre intervals along five transects across the study area. The testing program resulted in the recovery of 268 artefacts from 42 of the 55 units across the slope bordering Woodberry Swamp, at a mean density of 16.5 artefacts/m^3. A total of 38 of the trenches (69%) contained fewer than ten artefacts and 4 trenches contained between 11 and 20 artefacts. Unit C160, 80 metres from the margin of the swamp, contained 103 artefacts, but otherwise artefact densities were generally low. Silcrete dominated the assemblage (90%), with lesser frequencies of tuff, chert and acid volcanic stone (Umwelt Australia 1999a). Much of the assemblage (70%) was classified by Rheinberger as 'flaked pieces'. Further hand excavation was undertaken around units C160 and A360 and nearby to A360 and D20-D40. A total of 544 artefacts were recovered from the A360 excavation, along with 354 from C160, 93 from nearby to A360 and 61 from the vicinity of D20-40 (Umwelt Australia 1999a). Each assemblage was dominated by silcrete (80-90%) with a lower frequency of tuff and other materials.

A small conservation zone was subsequently recommended for the area around unit A360, with Section 90 Consent for the remainder of the evidence. However, salvage excavation of a sample of evidence around area C160 was required by DECC. Rheinberger (Umwelt Australia 1999b) undertook a two week salvage excavation of an unspecified area, resulting in the retrieval of 1,246 artefacts. Only a preliminary analysis was reported by Umwelt Australia (1999b), indicating silcrete (91% of the combined assemblage) was the dominant stone material and 'flaked pieces' (69%) and flakes (15%) the dominant artefact types.

Kuskie (1994a) surveyed Lot 1 DP 559519 for the 'Thornton County' (Somerset Park) residential development. The 228 hectare property is located adjacent to the Thornton urban area, although 85 hectares of SEPP 14 Wetland was excluded from the assessment. Lot 1 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. Lot 1 was used for pastoral purposes and therefore dominated by a dense cover of grass.

Despite conditions of low surface visibility, Kuskie (1994a) located nine artefact scatters and one isolated artefact. The sites ranged in size from 2 to 32 artefacts at densities of up to 9.4 artefacts/m^2. Flaked pieces and flakes were the dominant artefact types and silcrete was the primary stone material (83% of items). Kuskie (1994a:17) postulated that 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. As the effectiveness of the survey was severely constrained by the dense cover of grass, a program of further archaeological assessment was recommended.

Kuskie (1994b:1) undertook sub-surface investigations at "Somerset Park", in order to adequately assess the extent of the sites previously recorded, identify if sub-surface deposits were present, adequately assess the significance of each site and 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 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 upper 0-5 centimetres of soil. The soil was graded to one side and each transect inspected on foot. At 10 metre intervals along each first scrape, two 10 litre buckets of soil were sieved using 5 millimetre 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 used to conduct a second scrape along the same transects. The process of inspection was repeated, however two buckets of soil were sieved every 3 metres, in order to obtain a larger sample. The depths of the second transect varied, but the soil graded was generally between 5-20 centimetres deep, encompassing most of the A unit. Trenches measuring 3 x 1 metres and up to 0.5 metres deep were also excavated at each site, by use of a backhoe. Successive levels between 5-15 centimetres 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 have been 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).

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 (Kuskie 1994b:13).

A total of forty-six transects were excavated, comprising 23 initial grader scrapes and a second, deeper scrape at each location. This resulted in a total effective coverage of 11,716 m^2, for 46 transects, or approximately 0.5% of the 228 hectare property. This equates to 0.8% of the 143 hectare study area, excluding the wetlands zone. Using the effective coverage of 5,492 m^2 for the 23 initial grader scrapes, approximately 0.38% of the 143 hectare area was inspected, excluding the wetlands zone. Fourteen backhoe trenches were excavated, one at each site, to a total area of 42.9 m^2, an average of 3 m^2 each. A total of 21.57 m^3 of soil was sieved from the grader scrapes and backhoe trenches. A duplex soil was present, generally a 0.1 to 0.4 metre deep sandy silt A unit overlying a silty clay or clay B unit (Kuskie 1994b).

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 1,234 artefacts were recorded in the sample, comprising 1,026 artefacts from the sieves and 208 artefacts from the surface of transects (Kuskie 1994b:24-25).

Artefacts were located in every initial and second grader 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 (Kuskie 1994b). Artefact densities varied from 0.0011 to 0.04. artefacts/m^2, with a mean of 0.0177 artefacts/m^2. Volume densities varied from 5.36 to 139.84 artefacts/m^3, with a modest mean of 47.57 artefacts/m^3. 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).

The dominant artefact types were flaked pieces (34.6%) and flakes (27.6%), followed by chips (flakes less than 10 mm in maximum dimension), cores, flake portions, blades and blade portions. Evidence existed for the production of microblades and heat treatment of silcrete. Silcrete was by far the most common stone material within each site and the study area as a whole. The only notable internal variation was that sites 8 and 9 were comprised almost entirely of silcrete, to the exclusion of other stone materials. This is indicative of the different activities (procurement and reduction) which 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 tuff and very low numbers of quartz, chert, other sedimentary and volcanic stone were 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 metres distance, which included 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 Aboriginal activity is likely to be located around the margins of the wetlands. Comparisons of artefact density with elevation also supported this conclusion (Kuskie 1994b).

Most of the slopes sampled by Kuskie (1994b) 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 were available in Lot 1, the major one being the wetlands and no site is further than 300 metres from a potential source. A lower artefact density occurs in transects further than 200 metres from a fresh water source, but the sample is relatively small.

The sites were noted as being 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 levels of integrity. Recommendations were presented to conserve a representative sample of sites 6 and 9. Application for Section 90 Consent was recommended for the remaining evidence, in consultation with the Mindaribba LALC and in view of the Land Council's wishes for possible further salvage (Kuskie 1994b).

Adjacent to the Somerset Park study area of Kuskie (1994a, 1994b), Kuskie (2004a) surveyed a 142 hectare property known as the "Somerset Park Extension" and comprising part Lot 12 DP 603613, Lots 463 and 464 DP 870019, Lot 64 DP 651132 and Lot 469 DP 881116, Raymond Terrace Road, Thornton. The property was subdivided and inspected within 24 environmentally discrete survey areas. The total survey coverage equated to approximately 17.7% of the study area. The total effective survey coverage equated to around 0.1% of the study area. Hence, Kuskie (2004a) concluded that very low conditions of surface visibility constrained the ability to effectively assess the Aboriginal heritage resources potentially present within the property.

A total of nine Aboriginal heritage sites, all stone artefact occurrences, comprising fourteen loci of identified evidence were recorded by Kuskie (2004a). A total of 33 lithic items were identified. These items were dominated by silcrete (91% of the assemblage), with a lower frequency of volcanic tuff (9%) and several other stone materials. The lithic items mainly consisted of flakes (52% of the artefact assemblage), cores and core fragments (24%) and flake portions (14%). Several microblades and a microblade portion were the only other items identified (Kuskie 2004a).

Kuskie (2004a) identified a high potential for further heritage evidence to occur in the form of artefact deposits across much of the property. A Pleistocene age terrace was also identified in the study area. One artefact (a large silcrete core fragment) and possibly another item in site TA12 Locus C (a large brown tuff flake) occur on this terrace. These items are not inconsistent with known Pleistocene age evidence and it is questionable as to whether this landform unit was ever not submerged under estuarine or swamp water during all but the most recent period of the Holocene. Hence, Kuskie (2004a) concluded that potential exists that the identified evidence and other deposits of Pleistocene antiquity may exist within this terrace.

Kuskie (2004a) recommended that in order to adequately assess the potential impacts of the proposal on Aboriginal heritage and to select appropriate management strategies, further assessment should be undertaken once development plans had been formalised. Section 87 Permit #2112 was issued by DECC on 1 February 2005 to South East Archaeology for this purpose.

The sub-surface investigation involved a program of test excavations undertaken in March 2005 and reported by Kuskie and Clarke (2006b). The test excavations were undertaken within three separate test areas within the Somerset Park Extension. Each test area comprised a sample of units, each measuring 0.5 x 0.5 metres in area, excavated at five metre intervals on a 50 x 5 metre grid. Hence a total of 22 units were excavated for a total area of 5.5 m^2 in each test area. In total, 66 test units each measuring 0.25 m^2 in area were excavated, resulting in a total excavation area of 16.5 m^2. A total volume of deposit of 6.4 m^3 was excavated and wet-sieved. A total of 263 stone artefacts were recovered from the test excavations. Artefacts occurred at a relatively low overall mean density of 41.07/m^3 (or 15.94 per conflated m^2) (Kuskie and Clarke 2006b).

Three different categories of stone material were identified in the test excavation assemblage. Silcrete was the most common material (85.55% of the combined assemblage), followed by tuff (12.55%) and quartz (1.90%). Fifteen categories of artefacts were identified. The combined test excavation assemblage was overwhelmingly dominated by flakes (34.2%) and flake portions (51.7%) (including proximal, distal, medial and longitudinal portions). The remainder of the assemblage comprised very low frequencies of items, including lithic fragments (synonymous with 'flaked pieces', 7.2%), microblades and portions (1.9%), backed artefacts (including geometric microliths, bondi points and preforms) (1.5%), other retouched flakes (1.1%), bipolar flakes (0.8%) and utilised flakes (1.5%) (Kuskie and Clarke 2006b).

The spatial distribution of evidence within the Somerset Park Extension was examined to determine whether there are focal points of activity or particular relationships between Aboriginal behaviour and aspects of the locality's environment. The results demonstrate very little in the way of distinct patterning of evidence principally due to constraints by the low numbers of artefacts recovered for each of the samples (Kuskie and Clarke 2006b).

Kuskie and Clarke (2006b) concluded that occupation of Somerset Park Extension involved transitory movement and hunting/gathering without camping, undertaken in multiple episodes each of short duration. The overall spatial distribution and nature of evidence in Somerset Park Extension is a low density distribution of artefacts consistent with background discard, interspersed by a low number of discrete activity areas in which more focused activity has occurred, predominantly in relation to the production of backed artefacts or food processing. The intensity of use of this area is inferred to have been relatively low (Kuskie and Clarke 2006b).

Kuskie and Clarke (2006b) concluded that sites TA 1, 12 and 14 were of low to moderate scientific significance within a local context and low scientific significance within a regional context. Sites Thornton A 3, 13, 18 and 20 were assessed as being of low scientific significance within both local and regional contexts (Kuskie and Clarke 2006b). The primary recommendations arising from the investigation were that the proponent should seek and obtain from DECC a Section 90 Consent with Salvage for the development impact area, inclusive of all identified Aboriginal heritage evidence within this area, in consultation with the local Aboriginal community. A combination of strategies of salvage, conservation and unmitigated impact were recommended (Kuskie and Clarke 2006b).

Kuskie (2004c) surveyed part Lot 12 DP 603613 (now Lot 121 and Part Lot 122 DP 1108020), Lots 463 and 464 DP 870019, Lot 64 DP 651132 and Lot 469 DP 881116, Raymond Terrace Road, Thornton in relation to a proposed rezoning and residential development. It was subdivided and inspected within 28 environmentally discrete survey areas. The total survey coverage equated to approximately 15.3% of the study area. The total effective survey coverage equated to around 0.3% of the study area. Hence, Kuskie (2004c) concluded that very low conditions of surface visibility constrained the ability to effectively assess the Aboriginal heritage resources potentially present within the property.

A total of seven Aboriginal heritage sites, all stone artefact occurrences, comprising fifteen loci of identified evidence were recorded by Kuskie (2004c). A total of 71 lithic items were identified. These items were dominated by silcrete (72% of the assemblage), with a lower frequency of volcanic tuff (25%) and other stone materials. The lithic items mainly consisted of flakes (45% of the artefact assemblage), flake portions (28%) and microblades and microblade portions (16%). Two microlith implements were identified, a silcrete bondi point and a tuff geometric microlith. Several non-microlith tools were also identified, a silcrete utilised flake and a silcrete retouched/utilised piece ('scraper') (Kuskie 2004c). Kuskie (2004c) identified a high potential for further heritage evidence to occur in the form of artefact deposits across much of the property. Potential remnants of Pleistocene age terraces were also tentatively identified within the basal portions of three survey areas.

A 17 day program of test excavations was undertaken within part Lot 12 by South East Archaeology (Kuskie & Clarke 2006a) under Section 87 Permit #2113, in order to adequately assess the potential impacts of the proposal on Aboriginal heritage and to select appropriate management strategies. The program of sub-surface testing overcame limitations posed by very low conditions of surface visibility and enabled an adequate assessment of the nature, extent, integrity and significance of the Aboriginal heritage resources within part Lot 12. Test excavations were undertaken in nine separate areas and involved a sample from each of the key different 'environmental/cultural contexts' identified within the study area. Each test area comprised 22 units, each measuring 0.5 x 0.5 metres in area, excavated at five metre intervals on a 50 x 5 metre grid. Hence, for each area a total of 5.5 m^2 was excavated. In total, 198 test units were excavated, resulting in a total excavation area of 49.5 m^2. A total volume of deposit of 22.6 m^3 (22,608 litres) was excavated by hand and wet-sieved (Kuskie & Clarke 2006a).

A total of 262 artefacts were recovered from the test excavations. The overall mean count of artefacts per conflated square metre was 5.25. The overall mean density of artefacts per cubic metre was 11.50. Artefacts were present in 37% of the test units (Kuskie & Clarke 2006a). Five different categories of stone material were identified in the test excavation lithic assemblage. Silcrete was the most common material (71.37% of the combined assemblage), followed by tuff (25.57%), rhyolite (1.91%), quartz (0.76%) and other volcanics (0.38%). Evidence exists that a small proportion of the silcrete artefacts were made from stone that was intentionally thermally altered, although no specific evidence was recovered to indicate that this process was undertaken on-site. Relatively local alluvial sources are inferred for much of the stone material (Kuskie & Clarke 2006a).

A total of twenty categories of artefacts, in three technical classes, were identified. The combined test excavation assemblage is overwhelmingly dominated by flakes (38.2%) and flake portions (45.8%). The remainder of the assemblage comprises very low frequencies of items, including lithic fragments (synonymous with 'flaked pieces', 5.3%), microblades and portions (2.3%), backed artefacts (including geometric microliths, bondi points and preforms) (3.4%), backing flakes (2.3%), other retouched flakes (1.1%), bipolar flakes (0.4%), bipolar cores (0.4%) and other cores (0.8%) (Kuskie & Clarke 2006a). Many of the categories represent debris from stone knapping (eg. flakes and flake portions). The knapping can be non-specific (eg. flakes) or demonstrably relate to the production of microblades or microliths. Several of the artefact categories denote formal tool types (eg. bondi point and geometric microlith) or specific technologies (eg. bipolar flaking). Therefore while it can be inferred that a proportion of the Aboriginal activity within Lot 12 relates to the production of backed artefacts, presumably to arm spears, much of the stone artefact evidence represents debitage from which the specific activities cannot be reliably inferred. No tools or activity areas indicative of encampments were identified (Kuskie & Clarke 2006a).

The spatial distribution of evidence within Lot 12 was examined to determine whether there were focal points of activity or particular relationships between Aboriginal behaviour and aspects of the locality's environment. While there are a range of variables potentially influencing the nature and extent of human occupation of Lot 12, it was concluded that the proximity to the wetlands/former Hunter River estuary was the primary factor. The intensity of utilisation was greater within 300 metres of the wetlands than in areas further than 300 metres from the wetlands. Near the wetlands, occupation was typically of a higher intensity on the simple slopes and drainage depressions than on the spur crests, indicating some preferential location of activities in relation to landform unit. Evidence of microlith and microblade manufacture (indicating male hunting parties gearing up to hunt with spears) was only identified in contexts in close proximity to the wetlands. However, given the small sample size distant from the wetlands, it is uncertain if this evidence represents differences in the spatial distribution of activities conducted within Lot 12, or is a result of sampling error (Kuskie & Clarke 2006a).

Effectively, the overall spatial distribution and nature of evidence in Lot 12 is a very low density distribution of artefacts consistent with background discard, interspersed by a low number of discrete activity areas in which more focused activity has occurred, typically in relation to the production of microblades and microliths (Kuskie & Clarke 2006a). Occupation of Lot 12 appears to have primarily involved transitory movement and/or hunting and/or gathering without camping. The episodes may have involved small groups of people and been for short durations of time. The locality may not have supported occupation for longer durations or by larger groups of people because of the possible absence of permanent, potable water sources and/or dense vegetation. The presence, albeit in relatively low frequencies, of microliths and utilised microliths, is suggestive that the wetland margins were exploited for animal resources, although it is expected that plant resources would also have been exploited, probably by both men and women (Kuskie & Clarke 2006a).

Sites TN2, TN3, TN7, TN13 and TN20 were assessed as being of low scientific significance within both local and regional contexts. Sites TN8, TN9 and TN12 were assessed as being of low to moderate scientific significance within a local context and low scientific significance within a regional context. The primary recommendation arising from the Lot 12 investigation was that the proponent should obtain a Section 90 Consent with Salvage permit for the development impact area, inclusive of all identified Aboriginal heritage evidence within the area that may be subject to impact, in consultation with the local Aboriginal community. A combination of strategies of salvage, conservation and unmitigated impact were recommended (Kuskie & Clarke 2006a).

Synthesis:

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 Aboriginal sites within the Central Lowlands portion of the lower Hunter Valley (which excludes the immediate coastline) are artefact occurrences, typically containing low numbers of artefacts (eg. less than ten), occurring at a low density and situated within close proximity of drainage lines, wetlands or the former late-Holocene Hunter River estuary. Other site types have been located in the lower Hunter Valley, including grinding grooves, middens, bora/ceremonial sites, burials, scarred trees, stone arrangements, rock shelters with art, fish traps and places of historical or traditional Aboriginal significance. Silcrete and tuff are the dominant stone material types within the recorded artefact scatter sites. Many of the artefacts relate to non-specific knapping activities and to a lesser extent microblade production. Other activities such as microlith (backed artefact) production and discard of microlith and non-microlith tools are also represented by the evidence, but generally in low frequencies.

More than a decade ago it was noted 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 1989). Low ground surface visibility and limited survey work were forwarded as the key explanations. However, since that time significant studies (eg. Kuskie & Kamminga 2000) have identified that a substantial heritage resource exists around the margins of the wetlands and former Hunter River estuary, a resource which is typically obscured by vegetation and soil and can therefore only be identified by inspection of areas of ground disturbance or through archaeological excavation.

Recent investigations in a range of landscape contexts have enabled the refinement of earlier predictive models of Aboriginal site location. Previously, artefact scatters were generally predicted to occur close to watercourses, but also on level, elevated locations such as ridge crests and spur crests. Studies around the margins of wetlands have now revealed evidence of occupation on landform units such as wetland-bordering simple slopes and basal slopes. In fact, a number of substantive studies have demonstrated that artefacts tend to be distributed in a virtual continuum across the entire landscape at a relatively low mean density consistent with 'background discard' (manuport and artefact material which is insufficient either in number or in association with other material to suggest focused activity in a particular location - Rich 1993, Kuskie & Kamminga 2000), interspersed by areas of higher density where focused activity or repeated occupation has occurred (*cf.* Kuskie & Kamminga 2000, Kuskie & Clarke 2004, Kuskie & Clarke 2006a).

Artefact distribution therefore is widespread and tends to vary in relation to the nature of the activities performed and the locations of repeated activities. The spatial distribution of human activity and the resulting evidence tends to exhibit strong correlations to certain environmental factors such as landform element, slope and proximity to water and resources, as demonstrated by empirical data obtained from major salvage excavations and surveys throughout NSW (eg. Hall 1991, 1992, Hall and Lomax 1993, Kuskie 2000, 2005b, Kuskie and Clarke 2004, 2006a, Kuskie and Kamminga 2000, Packard 1991, 1992). However, evidence can also vary in relation to cultural factors.

The use of surface surveys as a sole method of identifying artefact scatter sites is clearly limited to the identification of evidence exposed by erosion or other ground disturbance (*cf.* Dean-Jones & Mitchell 1993). As demonstrated by the numerous studies discussed above, a substantial predicted or 'potential' resource typically exists, the nature and extent of which can only be resolved through sub-surface excavation.

Key research themes involved in archaeological analyses of the Hunter Valley have arisen from the large quantity of Environmental Impact Assessment driven work, particularly within the Central Lowlands region. These include the:

- Analysis of stone working technology by technical attributes, conjoining and discard events (*cf.* Baker 1992, Baker & Gorman 1992, Haglund 1989, 1992, 1995, Hiscock 1984, 1986, 1993, Hiscock & Koettig 1985, Koettig 1992, 1994, Kuskie & Kamminga 2000, Kuskie & Clarke 2004, Rich 1995);
- Spatial patterning of artefact distributions and arrangement of activity areas (*cf.* Koettig 1992, 1994, Kuskie 1994b, Kuskie & Kamminga 2000, Kuskie & Clarke 2004, 2006a, Rich 1995, Silcox & Ruig 1995);
- Heat treatment (*cf.* Baker 1992, 1996, Haglund & Rich 1995, Hiscock 1986, Koettig 1992, 1994, Kuskie & Kamminga 2000, Rowney 1992);
- Age of occupation (*cf.* Baker 1993a, b, c, d, 1994, Koettig 1987, 1992, 1994, Kuskie in prep., Kuskie & Kamminga 2000, Kuskie & Clarke 2004);

- Models of occupation (*cf*. Dean-Jones 1990, Dean-Jones & Mitchell 1993, Koettig 1994, Kuskie & Kamminga 2000, Kuskie & Clarke 2004, 2006a);
- Artefact and site functions, including use-wear and residue analysis (*cf*. Baker 1996, Barton 1994, Fullagar *et al* 1994, Kuskie & Kamminga 2000, Kuskie & Clarke 2004);
- Methodological issues (*cf*. Dean-Jones 1992, Dean-Jones & Mitchell 1993, Kuskie & Kamminga 2000, Kuskie & Clarke 2004); and
- Site integrity and post-depositional disturbance (*cf*. Dean-Jones & Mitchell 1993, Kuskie & Kamminga 2000, Kuskie & Clarke 2004).

Aboriginal occupation within the Central Lowlands of the Hunter Valley commenced at least 20,000 years ago. Koettig (1987) obtained a date of >20,200 years Before Present (BP) from a hearth at Glennies Creek, thirty-five kilometres north of Branxton. Kuskie (in prep.) identified at least one site of Pleistocene age, WB1 (#37-6-402) at the South Lemington mine near Singleton, on the basis of geomorphological evidence. 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 4,000 years of age (Brayshaw 1994:15, Kuskie & Clarke 2004).

3.3 Local Aboriginal Culture

Tindale (1974) compiled an assessment of Aboriginal clan territories in Australia. The Awabakal people are described as occupying land between Wyong and Maitland and Newcastle, west to Kurri Kurri, including the location of the present study area. The territory of the Worimi people is described as extending north from Maitland and Newcastle. The Wonnarua occupied an extensive territory from west of Maitland to the Dividing Range (Tindale 1974). The study area lies close to the boundary of these groups, although it is noted that such boundaries tended to be fluid (Peterson 1976).

A wide variety of subsistence resources were available to the local Aboriginal population. The nearby wetlands of Hexham Swamp and around Wallis Creek and elsewhere probably contained diverse and abundant floral species in the late Holocene, of which many would have been exploited. Sedges, grasses and various tubers and roots were possibly available, along with eels and fish. Brayshaw (1986) noted several observations made by early non-indigenous settlers of Aboriginals catching eels and fish in swamps in the district. No references are made of the exploitation of plant resources in the Maitland area, however early accounts often omitted the details of less visible (and predominantly female) plant gathering activities. Faunal species exploited would have included kangaroos, wallabies, echidna, emus, possums, flying fox, birds, wildfowl, goanna, snakes and honey from bees (Resource Planning 1993a:15).

The material culture of the local people would have included a variety of items made from bark, other components of plants, stone, shell, bone or other animal components (eg. fur), including shields, clubs, spears, digging sticks, boomerangs, water containers, canoes, rafts, message sticks, clapping sticks, spearthrowers, bark and vine cords, huts, netted and woven dilly bags, bone tools, shell tools, shell pendants, stone tools, fur belts and fur cloaks (*cf* Brayshaw 1986). Ethnohistorical observations are documented for the use of bark for huts, string, baskets and drinking vessels, and in cord for sewing canoes, fishing lines and nets (Brayshaw 1986).

Wood was used to make clubs, yamsticks, boomerangs, spears, spearthrowers, hatchets and shields (Resource Planning 1993a:14). Observations were made of gum or resin from *Acacia* and *Xanthorrhoea* species being used (Resource Planning 1993a:14). 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 1986).

Following the period of non-indigenous exploration and settlement, the Aboriginal population in the region was rapidly decimated by introduced diseases and disintegration of their traditional social structure. However, a large Aboriginal population remains in the region today, particularly focused on urban areas such as Maitland, and takes an active interest in their cultural heritage.

3.4 Predictive Model of Site Location

A predictive model of site location is constructed to identify areas of high archaeological potential (ie. 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:

- 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 East Maitland Hills sub-region of the Central Lowlands portion of the lower Hunter Valley and comprises simple slopes, drainage depressions, ridge crests and spur crests. As there is no potential for heritage evidence to exist in the areas classified as "modified" the remainder of this discussion relates to the unmodified study area. The following site location predictions are made for the unmodified study area:

ARTEFACT SCATTERS: In most archaeological contexts, an artefact scatter has been defined as either the presence of two or more stone artefacts within 50 or 100 metres of each other, or a concentration of artefacts at a higher density than surrounding low density 'background scatter'. Due to the nature of the underlying evidence, its identification only within exposures created by erosion or disturbance, and the limited suitability of existing definitions, Kuskie (2000) defined artefact scatter sites as the presence of one or more stone artefacts within a *survey area* (*cf*. Kuskie 2000). The boundaries of the site were defined by the boundaries of the survey area, regardless of the visible extent of artefacts. The survey areas are based on discrete, repeated *environmental contexts* termed *archaeological terrain units* (eg. a particular combination of landform unit and class of slope).

For the purposes of this assessment, artefact scatter sites are defined by the presence of one or more stone artefacts within a survey area (each survey area being a discrete environmental context). Each spatially discrete location of evidence within a survey area is defined as a site locus, with the boundaries of the site locus defined by the visible extent of artefacts (ie. Aboriginal objects protected under the *National Parks & Wildlife Act 1974*). However, as such a definition is somewhat arbitrary and does not necessarily reflect true cultural sites (temporally and spatially related evidence) and previous survey results lend support to the argument that artefacts are distributed across the landscape in a virtual continuum, but with evidence only identified in surface exposures or areas of disturbance, it is assumed that there is a similar probability for comparable evidence to occur elsewhere within the same survey area. Hence, while the visible site loci boundaries are defined by the extent of visible evidence (consistent with the definition of an Aboriginal object under the *National Parks & Wildlife Act 1974*), across the entire survey area in which a site is identified there exists a *potential resource* of comparable evidence.

An artefact scatter may consist of surface material only, which has been exposed by erosion, or it more typically involves a sub-surface deposit of varying depth. Other features may be present within artefact scatter sites, including hearths or stone-lined fireplaces, and heat treatment pits.

Artefact scatters may represent the evidence of:

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

The detection of artefact scatters depends upon conditions of surface visibility and ground disturbance and whether recent sediment deposition has occurred (*cf*. Dean-Jones and Mitchell 1993). Vegetation cover and deposition of sediments generally obscures artefact scatter sites and prevents their detection during surface surveys. High levels of ground disturbance can also obscure or remove evidence of a site.

Within the unmodified study area, there is generally a high potential for stone artefacts to occur in a widespread distribution of variable density across virtually all landform units, with a higher density of evidence and potentially deposits of research significance where more focused and/or repeated Aboriginal occupation has occurred (eg. along low-gradient drainage depressions and on low gradient simple slopes adjacent to drainages, particularly higher order streams).

However, a lower artefact density would be expected in areas of moderate gradient and in areas with high levels of ground disturbance any artefact evidence may have been totally impacted or the potential for sub-surface deposits of research significance substantially lowered. Field survey will clarify the nature, distribution and integrity of any artefact evidence within the study area.

BORA/CEREMONIAL SITES: Bora grounds are a type of ceremonial site associated with initiation ceremonies. They are usually made of two circular depressions in the earth, sometimes edged with stone. Bora grounds can occur on soft sediments in river valleys and elsewhere, although occasionally they are located on high, rocky ground where they may be associated with stone arrangements.

The potential for bora/ceremonial sites within the study area is assessed as being very low, due in large part to the recent history of land use.

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 very low, although cannot be discounted.

CARVED TREES: Carved trees were still relatively common in NSW in the early 20th century (Etheridge 1918). They were commonly used as markers for ceremonial or symbolic areas, including burials.

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type extremely rare. Given these factors and the extent of recent land use impacts, the potential for carved trees to occur within the study area is considered to be very low.

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 hatchets.

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. Considering the underlying geology of the study area, this potential is assessed as low to moderate for the drainage depression units and very low elsewhere.

LITHIC QUARRIES: 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 tuff or silcrete are present. Considering the underlying geology and known presence of silcrete cobbles elsewhere in the region, this potential is assessed as low to moderate.

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.

Consultation with the local Aboriginal community is essential to identify these site types, along with analysis of historical literature. However, considering the recent history of the locality, the potential for significant sites of traditional, historic or contemporary cultural value to remain is assessed on a preliminary basis as low.

SCARRED TREES: Scarred trees contain scars caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters.

Mature trees, remnants of stands of the original vegetation, have the potential to contain scars. Considering the long time period elapsed since this practice was prevalent, the extent of vegetation removal and the extent of recent land use impacts, the potential for scarred tree sites to occur within the study area is assessed as very 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.

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. Considering the extent of recent land use impacts, the potential for stone arrangements to occur within the study area is assessed as very low.

4. METHODOLOGY

During the initial stages of the investigation, research was conducted into the environmental and archaeological background of the study area, and searches were undertaken of the DECC 'Aboriginal Heritage Information Management System' and other relevant heritage registers and planning instruments.

Consultation and involvement of the Aboriginal community was undertaken as per the requirements of the DECC policy entitled *Interim Community Consultation Requirements for Applicants* (refer to Section 6).

Field inspection of the study area was undertaken by Peter Kuskie and Caroline Ingram of South East Archaeology, assisted on 30 and 31 July 2007 by Jason Brown and Guy Patten, and on 1 and 2 August 2007 by Steven Talbot and Kelly Griffiths, representing the Mindaribba LALC.

Approximately 210 hectares (66%) of the total study area has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive. These areas are marked as "modified" on Figure 4. Visual inspection was made of these areas to confirm that negligible potential for heritage evidence exists. Detailed survey was not conducted within these areas.

The remainder of the study area (referred to as the "unmodified study area") comprises land yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut, in which there remains some potential for heritage evidence (Figure 4). This area measures 108 hectares and comprises 34% of the study area. The detailed archaeological survey focused on the unmodified study area.

The unmodified study area was divided into particular combinations of environmental variables that are assumed to relate to Aboriginal usage of the area. These *Archaeological Terrain Units* were defined on the basis of landform element and class of slope (following McDonald *et al* 1984). They are discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location may be extrapolated to other similar locations. Therefore survey areas were defined as the individual archaeological terrain unit that is bounded on all sides by different archaeological terrain units (*cf*. Kuskie 2000).

Detailed recording of the archaeological survey areas was made on survey recording forms, including environmental variables and heritage resources identified or potentially present. Each survey area was assigned a unique reference code (B1, B2, etc) (Appendix 1). Surveying was completed within a single survey area prior to commencing inspection of another area.

Aboriginal heritage site recording forms for each identified site were also completed. Artefact scatter sites were defined by the presence of one or more stone artefacts within a survey area, regardless of the number of spatially discrete locations of evidence (loci) within that area. The boundaries of the Aboriginal site were defined by the boundaries of the survey area, regardless of the visible extent of artefacts. Spatially separate locations of heritage evidence within a survey area were recorded as separate loci within the one site (eg. site B19 Locus A, B19 Locus B, etc) (Appendix 2).

The rationale for this cultural landscape or broad area approach has been documented by Kuskie (2000) and primarily relates to the recognition that:

- Existing definitions of archaeological 'sites' are arbitrary and do not necessarily represent true cultural sites;
- Cultural evidence is distributed in a virtual continuum across the landscape;
- Evidence is generally only identified in surface exposures; and
- There is generally an equal probability for evidence to occur in all points of the same archaeological terrain unit or environmental context.

Stone artefacts were recorded on a lithic item recording form, including details about provenance, stone material type, artefact type, size class, cortex and other relevant attributes (Appendix 3).

Each survey area was inspected on foot by the archaeologists and several Aboriginal community representatives, with the focus on areas of higher ground surface visibility. Conditions of surface visibility were typically high across much of the study area, due to the removal of the forest vegetation in early 2004, by earthmoving equipment. This process has extensively impacted the A unit soil (in which stone artefacts could be expected to occur), often totally removing it or covering it with B unit clay (culturally sterile). Other impacts and exposures have arisen from dozer pushes, mine roads and other vehicle tracks and contour banks, along with erosion (Appendix 1).

5. RESULTS AND DISCUSSION

5.1 Survey Coverage

The unmodified study area has been subdivided into 26 survey areas, all of which were inspected for Aboriginal heritage evidence. The environmental contexts surveyed included the four landform elements and three classes of slope present (Appendix 1, Table 1). The locations of the individual survey areas are marked on Figure 4 and descriptions are presented in Appendix 1. A summary of the survey coverage is presented in Table 1, for the combined environmental contexts.

Table 1: Environmental Contexts - Survey Coverage and Artefact Summary.

Survey Areas	Area (ha)	Landform	Slope	% Comprises of Total Unmodified Study Area	Total Area Sampled (m^2)	% Sampled of Context	Effective Survey Coverage Total (m^2)	% Effective Survey Coverage of Context	Total # Artefacts	Artefact Density per m^2 of Effective Survey Coverage
B18, B21, B23	6.10	drainage depression	gentle	5.64%	24760	40.59%	2578	4.23%	16	0.006
B3, B8, B10, B16, B25, B26	13.54	drainage depression	moderate	12.52%	17780	13.13%	604	0.45%	1	0.002
B24	0.94	simple slope	gentle	0.87%	1500	15.95%	225	2.39%	0	-
B2, B5, B7, B9, B11, B14, B17	32.81	simple slope	moderate	30.33%	43550	13.27%	4380	1.33%	1	0.0002
B19, B20, B22	14.95	spur crest	gentle	13.82%	25640	17.15%	5155	3.45%	35	0.007
B4, B6, B12	5.43	spur crest	moderate	5.02%	7800	14.36%	1428	2.63%	0	-
B1, B15	19.36	ridge crest	level/very gentle	17.90%	26500	13.69%	2830	1.46%	0	-
B13	15.03	ridge crest	gentle	13.90%	19300	12.84%	3010	2.00%	0	-
	108.16 (Total)			100% (Total)	166,830 (Total)	15.42% (Mean)	20,210 (Total)	1.87% (Mean)	53 (Total)	0.003 (Mean)

Visual inspection confirmed that negligible potential for heritage evidence exists within the 210 hectares (66%) of the total study area that has been extensively impacted by earthmoving works and building (areas marked as "modified" on Figure 4).

The remainder of the study area (referred to as the "unmodified study area") measures 108 hectares and was subject to detailed archaeological survey. The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 166,830 m^2, or 15.4% of the unmodified study area. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 20,210 m^2, or 1.9% of the unmodified study area.

Conditions of surface visibility were typically high across much of the unmodified study area, due to the removal of the forest vegetation in early 2004, by earthmoving equipment. However, this process extensively impacted the A unit soil (in which stone artefacts could be expected to occur), often totally removing it or covering it with B unit clay (culturally sterile), and thereby reducing the levels of archaeological visibility and effective survey coverage. Archaeological visibility is the actual visible ground surface with potential for heritage evidence (accounts for factors such as ground disturbance and sediment deposition). Higher levels of archaeological visibility tended to occur on lightly formed vehicle tracks and erosion scours, particularly where A unit soil remained.

The extent of vegetation removal through the use of earthmoving equipment has substantially lowered the potential for most other forms of heritage evidence (eg. carved trees, scarved trees and stone arrangements) to occur within the unmodified study area. Very few mature trees were identified, with only some native vegetation remaining around the western and northern margins of the unmodified study area. These were inspected for evidence of Aboriginal scarring but none was identified. No silcrete cobbles or tuff outcrops were identified within the study area of sufficient size to have served as lithic quarries. Few areas of exposed sandstone or sedimentary bedrock were identified within the study area (particularly in the drainage depressions) and no grinding grooves were identified.

The level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the study area. Hence, the survey provides a valid basis for determining the probable impacts of the proposal and formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

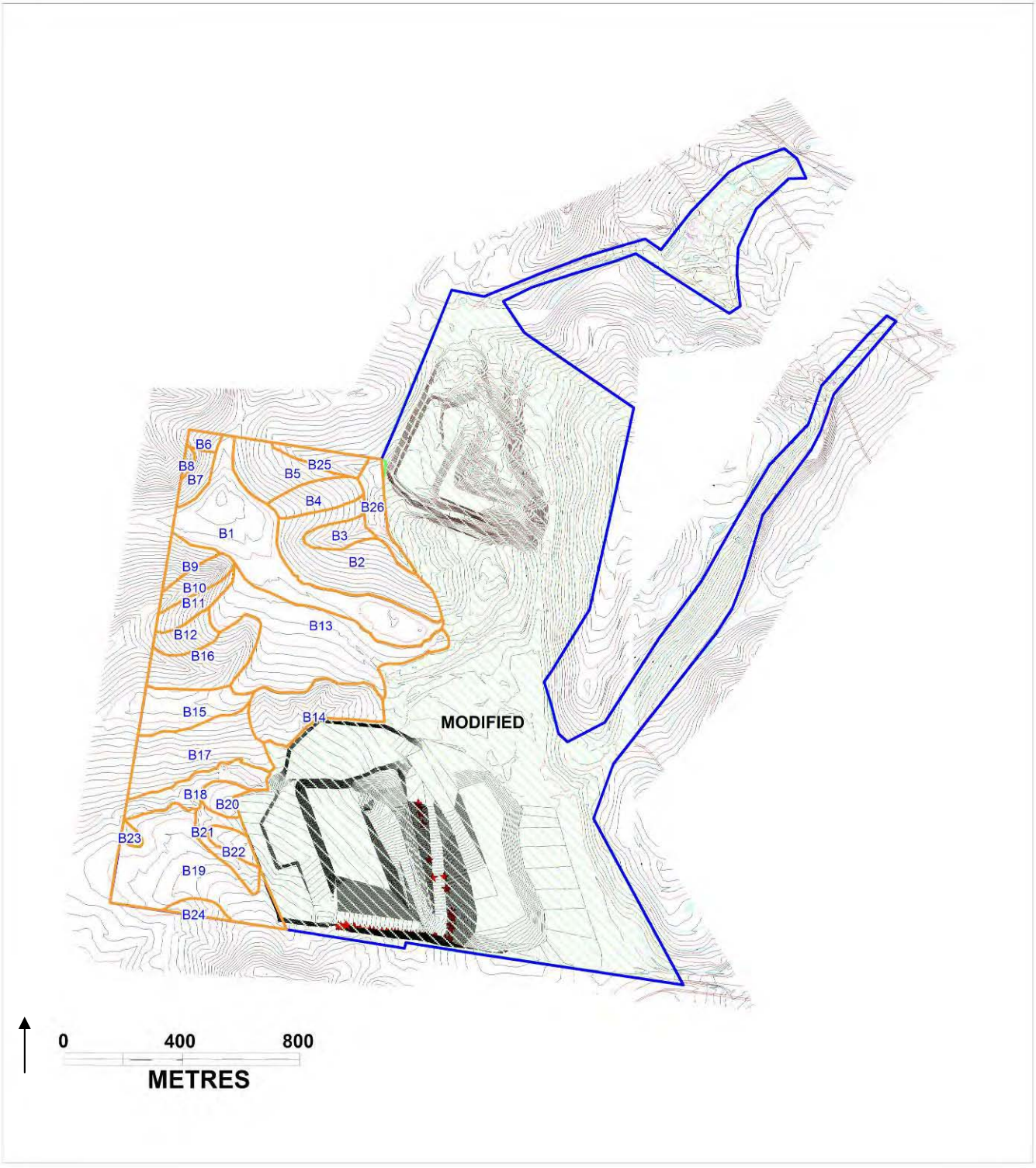

Figure 4: Location of Archaeological Survey Areas Within the Unmodified Study Area and the Remaining "Modified" Portion of the Study Area.

Figure 5: Location of Archaeological Survey Areas and Aboriginal Heritage Evidence Within the Unmodified Study Area (survey areas - orange outline, broad site areas - light pink shading, site loci - dark pink shading).

5.2 Aboriginal Heritage Evidence

A total of six Aboriginal heritage sites, all stone artefact occurrences, comprising nineteen loci of identified evidence, have been recorded within the present unmodified study area. The details of these sites are presented in Appendix 2 and their locations are marked on Figure 5. Details of the lithic items are presented in Appendix 3 and summarised in Table 3. A description of each site within the present study area is presented below and summarised in Table 2.

Table 2: Summary of Aboriginal Heritage Sites Within the Unmodified Study Area.

Broad Site Name	Slope	Landform	Site Locus	# Artefacts	Artefact Density per m^2 of Effective Locus Area
Bloomfield 2 (B2)	moderate	simple slope	A	1	1.67
Bloomfield 16 (B16)	moderate	drainage depression	A	1	2.50
Bloomfield 18 (B18)	gentle	drainage depression	A	2	1.25
			B	3	0.19
			C	1	1.11
			D	8	0.02
			E	1	2.00
			F	1	2.00
Bloomfield 19 (B19)	gentle	spur crest	A	3	0.09
			B	1	1.43
			C	3	0.06
			D	3	0.50
			E	3	0.13
			F	1	5.00
			G	2	2.00
			H	2	1.00
Bloomfield 20 (B20)	gentle	spur crest	A	4	1.11
			B	11	0.01
Bloomfield 22 (B22)	gentle	spur crest	A	2	1.67

Site Bloomfield 2 (B2):

Site B2 is an artefact scatter comprising one visible locus of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses the moderately inclined simple slope in the northern portion of the unmodified study area.

Locus A is situated around MGA grid reference 365243:6369702 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises a single artefact, a silcrete flake portion, exposed on a vehicle track at the margin of the cleared area and the remnant forest (Appendix 3, Plate 6). Conditions of archaeological visibility average 60% at the locus. Levels of ground disturbance are moderate to high and there is minimal potential for a sub-surface deposit to occur.

Much of the broad site area of B2 has been subject to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, including deposits that may be *in situ* and/or of research value, is very low. The northern-most portion of the broad site area retains forest vegetation, however previous land use has resulted in moderate levels of disturbance and the A unit soil appears to be relatively shallow. As such, although there is some potential for sub-surface deposits of artefacts to occur in the forested area, they are anticipated to be shallow in nature and unlikely to be *in situ* or of research value, given the thin A unit soil, levels of ground disturbance and predictive model.

Site Bloomfield 16 (B16):

Site B16 is an artefact scatter comprising one visible locus of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses the moderately inclined drainage depression in the central portion of the unmodified study area.

Locus A is situated around MGA grid reference 364860:6369212 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises a single artefact, a silcrete flake, exposed within an area extensively affected by mechanical removal of vegetation (Appendix 3, Plate 7). Conditions of archaeological visibility average 40% at the locus. Levels of ground disturbance are high and there is minimal potential for a sub-surface deposit to occur.

Almost the entire broad site area of B16 has been subject to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, including deposits that may be *in situ* and/or of research value, is very low.

Site Bloomfield 18 (B18):

Site B18 is an artefact scatter comprising six visible loci of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses a gentle drainage depression (second order headwater tributary of Buttai Creek) in the southern portion of the unmodified study area.

Locus A is situated around MGA grid reference 364760:6368780 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises two artefacts, a silcrete flake and a silcrete flake portion, exposed in a 2 x 1 metre area on a vehicle track bordering the forest, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 8). Conditions of archaeological visibility average 80% at the locus. Levels of ground disturbance are moderate to high and although some A unit soil remains, the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus B is situated around MGA grid reference 364683:6368726 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises three artefacts, a tuff flake, a tuff flake portion and a silcrete microblade portion. The artefacts are exposed in a 9 x 2 metre area on a vehicle track bordering the forest, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 9). Conditions of archaeological visibility average 90% at the locus. Levels of ground disturbance are moderate to high and although some A unit soil remains, the potential for a sub-surface deposit that is *in situ* and/or of research value is relatively low.

Locus C is situated around MGA grid reference 364691:6368716 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises one artefact, a tuff flake, exposed on a dozer push adjacent to the vehicle track bordering the forest, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 9). Conditions of archaeological visibility average 90% at the locus. Levels of ground disturbance are moderate to high and although some A unit soil remains, the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus D is situated around MGA grid reference 364640:6368692 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises eight artefacts, including three silcrete flake portions, a silcrete flake, a silcrete lithic fragment, a tuff flake, a tuff core fragment and a volcanic flake. The artefacts are exposed within a 50 x 15 metre area on a vehicle track and adjacent areas extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 10). Conditions of archaeological visibility average 50% at the locus. Levels of ground disturbance are moderate to high and although some A unit soil remains, the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus E is situated around MGA grid reference 364782:6368705 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises one artefact, a tuff flake, exposed on a vehicle track across the drainage, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 11). Conditions of archaeological visibility average 50% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus F is situated around MGA grid reference 364825:6368742 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises a single artefact, a silcrete flake, exposed on an erosion scour in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 12). Conditions of archaeological visibility average 50% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Almost the entire broad site area of B18 has been subject to moderate to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, particularly deposits that may be *in situ* and/or of research value, is low.

Site Bloomfield 19 (B19):

Site B19 is an artefact scatter comprising eight visible loci of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses the broad gently inclined spur crest in the southern portion of the unmodified study area.

Locus A is situated around MGA grid reference 364673:6368665 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises three artefacts, a silcrete flake, a silcrete lithic fragment and a tuff flake. The artefacts are exposed in a 8 x 5 metre area in an erosion scour within an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 13). Conditions of archaeological visibility average 80% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus B is situated around MGA grid reference 364693:6368660 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises one artefact, a tuff flake, exposed near a dozer push in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 14). Conditions of archaeological visibility average 70% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus C is situated around MGA grid reference 364736:6368702 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises three artefacts, two tuff flakes and a tuff flake portion. The artefacts are exposed in a 25 x 5 metre area on an erosion scour in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3). Conditions of archaeological visibility average 40% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus D is situated around MGA grid reference 364782:6368671 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises three artefacts, a silcrete flake, a quartzite flake and a tuff core fragment. The artefacts are exposed in a 5 x 2 metre area on an erosion scour in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 15). Conditions of archaeological visibility average 60% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus E is situated around MGA grid reference 364798:6368656 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises three artefacts, a tuff flake, a silcrete flake and a silcrete lithic fragment. The artefacts are exposed in a 50 x 3 metre area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 16). Conditions of archaeological visibility average 15% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus F is situated around MGA grid reference 364920:6368348 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises a single artefact, a tuff flake, exposed on a dozer push in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 17). Conditions of archaeological visibility average 20% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus G is situated around MGA grid reference 364942:6368391 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises two artefacts, a tuff flake and a tuff flake portion, exposed within 5 x 2 metre area of an erosion scour next to a vehicle track, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 18). Conditions of archaeological visibility average 10% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Locus H is situated around MGA grid reference 364965:6368408 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises two artefacts, a silcrete flake and a silcrete core, exposed within a 2 x 2 metre area on a dozer push, in an area extensively affected by mechanical removal of vegetation and earthmoving works (Appendix 3, Plate 19). Conditions of archaeological visibility average 50% at the locus. Levels of ground disturbance are high and the potential for a sub-surface deposit that is *in situ* and/or of research value is low.

Almost the entire broad site area of B19 has been subject to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, particularly deposits that may be *in situ* and/or of research value, is low to very low.

Site Bloomfield 20 (B20):

Site B20 is an artefact scatter comprising two visible loci of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses a gentle spur crest in the southeastern corner of the unmodified study area.

Locus A is situated around MGA grid reference 364851:6368764 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises four artefacts exposed within a 3 x 3 metre area of erosion scours that has been extensively affected by mechanical removal of vegetation and earthworks (Appendix 3, Plate 20). Conditions of archaeological visibility average 40% at the locus. The artefacts comprise a silcrete flake, silcrete flake portion, silcrete lithic fragment and tuff retouched flake. Levels of ground disturbance are high and there is a low potential for a sub-surface deposit to occur, particularly one that is *in situ* and/or of research value.

Locus B is situated around MGA grid reference 364875:6368714 (artefact #1) on the Beresfield 9232-3N 1:25,000 topographic map. It comprises eleven artefacts exposed within a 100 x 60 metre area extensively affected by mechanical removal of vegetation and earthworks (Appendix 3, Plate 20). Conditions of archaeological visibility average 20% at the locus. The artefacts comprise two silcrete cores, three silcrete flakes, a tuff core, a tuff core fragment, a tuff retouched piece, two silcrete flake portions and a silcrete lithic fragment. Levels of ground disturbance are high and there is a low potential for a sub-surface deposit to occur, particularly one that is *in situ* and/or of research value.

The entire broad site area of B20 has been subject to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, including deposits that may be *in situ* and/or of research value, is low to very low.

Site Bloomfield 22 (B22):

Site B22 is an artefact scatter comprising one visible locus of evidence (Figure 5, Appendix 2). The identified and potential evidence encompasses a gentle spur crest in the southeastern corner of the unmodified study area.

Locus A is situated around MGA grid reference 364924:6368567 on the Beresfield 9232-3N 1:25,000 topographic map. It comprises two artefacts, a silcrete flake portion and a silcrete core, exposed within a 2 x 2 metre area extensively affected by mechanical removal of vegetation and earthworks, adjacent to soil stockpiles (Appendix 3, Plate 21). Conditions of archaeological visibility average 30% at the locus. Levels of ground disturbance are high and there is minimal potential for a sub-surface deposit to occur.

The entire broad site area of B22 has been subject to high levels of ground disturbance through mechanical removal of vegetation and earthmoving works (Appendix 1). In this cleared area, the potential for sub-surface deposits of artefacts, including deposits that may be *in situ* and/or of research value, is very low.

5.3 Discussion

The results of the investigation are discussed below, including the potential integrity of the evidence, nature of the evidence and interpretations of the evidence.

Integrity:

The integrity of the identified sites and the remainder of the study area can primarily be assessed for surface evidence only through examination of land use impacts. Controlled excavation enables integrity to be assessed through the horizontal and vertical distribution of artefacts and by conjoining items.

Recent, non-Aboriginal land-use practices have extensively affected the study area (Plates 1-21). Approximately 210 hectares (66%) of the total study area has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive ("modified" on Figure 4, refer also to Plates 1-3 and 5). These works include the active-areas of open cut mining known as the "S-Cut" and "Creek Cut" and adjacent rehabilitated backfill, the haul road from the S-Cut to the washery and the workshop area and access road to the workshop from the Creek Cut.

The remainder of the study area ("unmodified study area") comprises land yet to be mined area immediately west of the S-Cut and southwest of the Creek Cut (Figure 4, Plates 6-21). This area measures 108 hectares and comprises 34% of the study area. However, extensive recent impacts have occurred across almost this entire area. The principal impact has been from the removal of the forest vegetation in early 2004, by earthmoving equipment. This process has extensively impacted the artefact-bearing A unit soil, often totally removing it or covering it with B unit clay (culturally sterile). Large windrows of vegetation are present. Other impacts have arisen from dozer pushes, mine roads and other vehicle tracks, biosolid stockpiles, soil stockpiles, bark chip stockpiles, powerlines, pipelines, mine infrastructure such as water tanks and contour banks, along with erosion.

These impacts have substantially reduced the integrity of the identified artefact evidence within the unmodified study area, and probably removed other forms of heritage evidence (eg. scarred trees) had they been originally present. Bioturbation and erosion have also affected the identified and potential evidence within the unmodified study area. Levels of ground disturbance were recorded during the survey (Appendix 1). Apart from one small portion of a spur crest (B6), all survey areas exhibit moderate-high to high levels of ground disturbance. Levels of ground disturbance are also moderate-high to high at each of the recorded site loci (Appendix 2). None of the survey areas or site loci are characterised by low or low-moderate levels of disturbance.

The potential for further heritage evidence to occur in the unmodified study area in the form of sub-surface deposits of stone artefacts is generally low, although shallow deposits may be present in some forested areas or along the drainage (eg. unit B18) where A unit soil may have been retained. However, the potential for deposits that may be *in situ* and/or of research value is low to very low, considering the shallow A unit soil, levels of ground disturbance and occupation model.

Table 3: Combined Stone Artefact Assemblage of the Aboriginal Heritage Sites Within the Unmodified Study Area.

	Stone Material				
Lithic Item Type	acid volcanic	quartzite	silcrete	tuff	Total
core			4	1	5
core fragment				3	3
flake	1	1	12	11	25
flake - distal			2		2
flake - longitudinal			5	2	7
flake - medial			1	1	2
flake - proximal			1		1
lithic fragment			5		5
microblade - proximal			1		1
retouched flake				1	1
retouched piece				1	1
Total	1	1	31	20	53

Stone Materials:

A total of 53 lithic items were recorded during the survey (Appendix 3, Table 3).

The majority (31 or 58%) of the artefacts are made of silcrete. 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 can be precipitated from solution by evaporation, cooling, the neutralisation of strongly alkaline solutions, reaction with cations, adsorption by solids and the life-processes of organisms (Summerfield 1983:76). In weathered profiles, downward percolation of silica released through bedrock weathering and clay mineral authigenesis, together with water-table fluctuations, are suitable conditions for formation (Summerfield 1983:80). 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).

Silcrete was an attractive material to the local Aboriginal people because of its flaking properties and availability. Flakes have sharp, reasonably durable edges and implements made from the stone were used for a variety of tasks, including woodworking and spear barbs. Archaeological and geological studies in the Central Lowlands have identified various terrestrial and alluvial sources of silcrete, including nearby at the Freeway Business Park (Kuskie 2004d), Thornton (Kuskie 1994b) and Bolwarra Heights (Baker 1997). Silcrete cobbles were not identified within the study area during the present investigation and the minor silcrete gravel is too small to have represented a suitable source for the material.

Only one silcrete artefact exhibited cortex, of the smooth waterworn variety, indicative of an alluvial gravel source (such as those associated with the Hunter River). The silcrete items are all small (maximum dimension of 60 millimetres), but the sample is too small to make further inferences about the probable stone source.

Many of the silcrete lithic items exhibit a distinctive pink or red colouration (resulting from thermal alteration of iron oxides to haematite), typically indicative of thermal alteration. Deliberate thermal alteration (heat treatment) of silcrete was in widespread use in the Hunter Valley (*cf* Kuskie & Kamminga 2000) and involved controlled heating to specific temperatures and slow cooling to alter the flaking qualities. The original poorly ordered, strongly interlocking microfabric becomes more equigranular and crystallised (Domanski & Webb 1992:612). However, a proportion of the colour change may also be explained by bushfire or other forms of unintentional heating. A proportion of the natural silcrete gravel within the study area appears to have been altered by bushfire.

Twenty (37.8%) of the assemblage is comprised of tuff. Tuff is a fine grained, isotropic stone formed after a cloud of ash was ejected in an explosive volcanic eruption. The ash settled to the ground or through ponded water. After burial, some tuff beds became indurated, through a low-grade metamorphic process (probably involving pressure) in which the stone recrystallised to a more stable structure. Tuff samples examined from the lower and upper Hunter are rhyolitic in chemical composition (quartz and potassium-feldspar, occasionally with layer silicate or goethite) (Kuskie & Kamminga 2000).

Tuff is typically grey in colour in the lower Hunter (a function of grain size, not a reference to individual grains, which can be of a variety of colours). However, tuff is porous enough for the diffusion of iron bearing solution, with iron precipitating out to give a yellow, brown, red or orange colour. Variations to the surface colouration can also result from weathering processes. In the present survey area, the two tuff items are cream in colour, probably as a result of surface weathering processes.

Volcanic tuffs occur in widespread seams throughout the Hunter Valley and are occasionally exposed in drainage lines or in cliff faces, or the cobbles become worked into river gravels (eg. Hunter River and its tributaries) where they represent a readily available source of the material. Tuff is present within the underlying bedrock, although only small gravel was observed within the study area and it is unlikely that these would have functioned as a source of the material. A number of other tuff sources have been identified within the locality, including nearby at Black Hill (Kuskie & Kamminga 2000) and it is possible that the tuff artefacts within the study area were procured from relatively local sources. Two of the tuff artefacts exhibit waterworn cortex indicating an alluvial source, one a tabular cortex and another a rough terrestrial cortex. The latter two indicate possible terrestrial outcrop and colluvial gravel sources.

The only other stone materials identified were single acid volcanic and quartzite items.

Lithic items:

The combined assemblage is dominated by flakes (25 items or 47% of the assemblage), flake portions (12 items or 22.6%), lithic fragments (5), cores (5) and core fragments (3), with a single microblade portion, retouched flake and retouched piece (Appendix 3, Table 3).

These items may represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard. The tuff retouched flake in site B20/A may represent a stage of manufacturing a bondi point (ie. a preform).

No diagnostic microlith or non-microlith tools were identified, items that tend to be of higher interpretive value. The small size of the artefact sample may be a one determinant of the limited range of artefact types and activities represented by the identified evidence in the study area.

Spatial Patterning:

The spatial distribution of evidence can be examined, particularly in relation to environmental variables such as slope and landform element and proximity to watercourses. However, the inferences that can be made from this comparison are limited by the small nature of the sample and high levels of ground disturbance across the unmodified study area.

The identified site loci occur on three of the four landform units present within the study area. Eleven of the loci occur on spur crests and seven within drainage depressions, with only a single locus on a simple slope and no evidence on ridge crests. Almost all of the site loci occur in the southern portion of the unmodified study area, which is dominated by a broad gentle spur crest and the first and second order tributaries of the headwaters of Buttai Creek (Figure 5). In fact, thirteen (68%) of the site loci occur within about 100 metres of the second order tributary. All apart from two site loci occur on gentle gradients, with loci B2/A and B16/A occurring on moderate gradients.

Examination of artefact counts and densities within the different environmental contexts (ie. combinations of landform element and class of slope; refer to Table 1) also indicate that most evidence is located on gentle slopes and spur crests and drainage depressions. The artefact densities are very low across the study area (mean of just 0.003 artefacts per square metre of effective survey coverage) but much lower in the moderate simple slope context ($0.0002/m^2$) than in the moderate drainage depression ($0.002/m^2$), gentle drainage depression ($0.006/m^2$) or gentle spur crest ($0.007/m^2$) contexts.

To some degree, this result may be attributable to variation in the high levels of ground disturbance across the unmodified area, which tend to be even higher in the northern portion of this area which is dominated by ridge crests (on which mine roads and stockpiles tend to be situated) and moderate simple slopes (in which the A unit soil may have been subject to greater impacts through the mechanised removal of vegetation). However, the recording of *archaeological visibility* (which is an attempt to measure the visible ground surface with potential to host heritage evidence, as opposed to just the visible ground surface which may include recent sediment deposition or B unit clay in which stone artefacts would not be identified) and resulting *effective survey coverage* should remove this potential factor of bias.

The density results (based on *archaeological visibility* and *effective survey coverage*) clearly indicate a trend for relatively higher artefact discard to occur on the gentle gradient units than the moderate slopes, which is consistent with the results of surveys and excavations elsewhere in the Central Lowlands region and general models of Aboriginal occupation. The density results also indicate a trend for relatively higher artefact discard to occur on the spur crest and drainage depression units, but more so on areas of gentle than moderate gradient. Again, these results, along with the focus of evidence within 100 metres of the second order tributary of Buttai Creek, are consistent with the results of surveys and excavations elsewhere in the Central Lowlands region and general models of Aboriginal occupation. However, in overall terms, the evidence represents a very low density distribution of artefacts consistent with background discard.

Site Interpretation:

It is inferred on a preliminary basis from the evidence at the Aboriginal sites recorded within the present study area and from other sources that:

- Aboriginal people occupied the locality of the study area within the past 4,000 years. Occupation of the region extended as far back as at least 20,000 years ago, but the environmental context would have differed substantially to the present conditions over such a period of time;

- The stone materials silcrete and tuff were favoured for artefact manufacture. Silcrete was heat treated, although it is uncertain if this procedure occurred on-site. Both materials were probably procured from sources within the lower Hunter Valley; and

- Aboriginal occupation of the unmodified study area was of a low intensity, and probably related to transitory movement through the landscape and hunting/gathering by small groups of people during the course of the normal daily round. The general absence of level/very gentle land suitable for camping, particularly near higher order watercourses, along with the absence of higher order watercourses and multiple resource zones (eg. associated with estuarine or swamp environments) and the moderate gradient of slopes within much of the unmodified area render it generally unsuitable for focused occupation (eg. encampments). Other nearby locations (eg. around Wallis Creek, several kilometres to the northwest) would have been far more suitable for camping and focused occupation (ie. repeated visits, visits of longer duration, visits by larger groups of people), with the proximity to subsistence resources from multiple zones and the presence of well drained level to gently inclined ground and potable water. It is inferred that people temporarily based in these zones occasionally visited the study area for short durations of time.

Regional Context:

The nature of the evidence from the study area can be compared with other studies and sites in the region (refer to Section 3.2). The primary purpose is to identify similarities and differences with other reported evidence, in order to provide a framework for interpreting representativeness and assessing potential cumulative impacts.

Several primary similarities have been identified with other survey areas in the Maitland locality (refer to Section 3.2), particularly those in adjacent areas within the East Maitland Hills at Donaldson and Weakleys Drive (Effenberger 1997, Kuskie 2004d, 2005a, 2006, Umwelt 1998a, 1998b, 2001b, 2001c) including the:

- Predominance of stone artefact evidence;

- Similar stone material and artefact types;

- Low artefact numbers and densities; and

- Presence of evidence in similar environmental contexts.

No specific aspects of the evidence within the study area appear to be unique or not replicated elsewhere within a regional context.

The extent to which the environmental contexts and heritage evidence present within the study area may exist elsewhere in the Central Lowlands region is relevant to the development of management strategies for the heritage evidence and assessment of cumulative impacts. Topographical mapping and aerial photographs can be used to prepare a preliminary assessment, as suitable quantitative baseline data is absent.

Within the lower Hunter Valley region of the Central Lowlands, it is possible that focalised impacts (areas in which heritage is unlikely to survive, such as urban areas, mines and roads) may have affected around 5% of the region. Other non-focalised land use impacts (such as agricultural, pastoral and forestry uses) may have affected around 80-95% of the region. Areas specifically reserved for conservation (eg. National Parks, Nature Reserves and registered conservation zones) probably amount to less than 5% of the region. However, the major reserves (eg. Hexham Swamp Nature Reserve and Kooragang Nature Reserve) tend to comprise wetlands rather than elevated terrain units like those within the present study area. One exception is the conservation areas associated with Donaldson Coal Mine, immediately east of the present study area. Two sizeable 'Bushland Conservation Areas' totalling 960 hectares are situated either side of Donaldson Mine, and include the same environmental contexts and comparable heritage evidence as identified within the present study area.

Within the East Maitland Hills landscape, it is apparent from examination of the Beresfield and Maitland topographical maps that similar environmental contexts to the present study area do exist. However, the extent of existing land use impacts, particularly urban development, on these areas is high. Much of the East Maitland Hills terrain has been developed for or has the potential to be developed in future for urban settlement. Hence, the Bushland Conservation Areas at Donaldson Mine immediately adjacent to the present study area have significant value in terms of conserving the range of identified and potential heritage evidence that is likely to be impacted should the current project proceed.

However, given the high levels of existing impacts within the study area and the low to very low potential for any sub-surface deposits that may be *in situ* and/or of research value, it is concluded that the cumulative effect of the completion and rehabilitation of the Bloomfield Colliery on the identified and potential Aboriginal heritage resources of the region will be very low. In addition, mitigation measures can be implemented to further reduce the impacts of the proposal on the identified Aboriginal heritage evidence (refer to Section 9).

Reassessment of Predictive Model of Site Location:

In view of the survey results, the predictive model of site location (refer to Section 3.4) can be reassessed.

Detailed survey of the unmodified portion of the study area has identified high levels of ground disturbance associated with the widespread mechanised removal of vegetation in 2004 and other mining related activities conducted under existing approvals. Forest vegetation is only retained in small portions of the western and northern fringes of the unmodified study area.

On the basis of the survey results, the potential for bora/ceremonial, carved tree, scarred tree and stone arrangement sites to occur within the study area can be revised downward to very low or negligible.

No sources of tuff or silcrete of sufficient size and quality to be utilised for stone artefacts were identified within the study area. As such, the potential for evidence of lithic quarry sites can be revised downward to very low or negligible.

Minor areas of sandstone bedrock are exposed within the unmodified study area, in drainage depressions and on slopes and crests. The extent to which the exposures in the latter units is a product of the extensive earthmoving works and ground disturbance is unclear. However, no evidence of grinding grooves was located and the potential for this type of evidence can be revised downward to very low or negligible.

Sites of traditional cultural significance (eg. mythological sites) were not identified by the Aboriginal representative involved in the investigation. The registered Aboriginal stakeholders also did not disclose any specific knowledge of other cultural values/places (eg. historically known places, resource use areas, etc.). However, the possibility cannot be excluded that Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted.

No evidence was encountered of burial sites, and although the potential for skeletal remains to occur within the study area is considered to be very low, it cannot be discounted.

Stone artefact evidence has been identified within the unmodified study area, confirming predictions of the site location model. In overall terms, the evidence represents a very low density distribution of artefacts consistent with background discard, with relatively higher densities on the gentle gradient units than the moderate slopes, and on the spur crest and drainage depression units, but more so on areas of gentle than moderate gradient. Further artefacts are expected to occur across the unmodified study area in a distribution and density consistent with these results, particularly in areas that were obscured by vegetation or not directly sampled during the survey (apart from areas totally impacted by recent land use, in which the potential for evidence is negligible). However, notwithstanding that shallow deposits may be present in some forested areas or along the drainage (eg. unit B18) where A unit soil may have been retained, the potential for sub-surface deposits that may be *in situ* and/or of research value is low to very low, considering the shallow A unit soil, levels of ground disturbance and occupation model.

6. ABORIGINAL CONSULTATION

The indigenous heritage impact assessment has involved a comprehensive program of Aboriginal consultation that complies with the policy requirements of the Department of Environment and Climate Change (NSW) that were introduced on 1 January 2005. These requirements are specified in the policy entitled *Interim Community Consultation Requirements for Applicants* and involve the following procedures:

1) Providing written notification of the project to the Local Aboriginal Land Council, Department of Environment and Climate Change (NSW), Registrar of Aboriginal Owners (Department of Aboriginal Affairs), NSW Native Title Services and relevant Local Councils, requesting that if they are aware of any Aboriginal persons/organisations who may wish to be consulted about the project to provide such advice in writing, with a minimum 10 day response period;

2) Providing written notification of the project directly to those Aboriginal persons/organisations that were identified in Step 1 above, requesting those who may be interested in participating in the project to register their interest in writing, with a minimum 10 day response period;

3) Placing a media advertisement to the same effect in the local press requesting any Aboriginal persons/organisations who may be interested in participating in the project to register their interest in writing, with a minimum 10 day response period;

4) Providing detailed information about the heritage impact assessment, including the proposed methodology, to the Aboriginal persons/organisations who registered their interest in writing in Steps 1-3 above, with a minimum 21 day response period for comments;

5) Comments received from registered Aboriginal persons/organisations in Step 4, including information on areas of cultural significance, potential culturally acceptable mitigation measures, the nature of the assessment methodology and any other relevant traditional knowledge or issues, must be considered in order to finalise the assessment methodology;

6) Field inspection in consultation with the registered Aboriginal stakeholders;

7) Notifying the registered Aboriginal stakeholders and the Local Aboriginal Land Council (even if not registered) of the availability of the draft Aboriginal heritage impact assessment report and their comments invited; and

8) Preparation of a final Aboriginal heritage impact assessment report that addresses and incorporates the input of the registered Aboriginal stakeholders.

Procedures #1-8 outlined above have been implemented, as documented in the consultation database in Appendix 5 and below.

Compliance with Procedure #1 was achieved through correspondence forwarded to the relevant organisations on 9 May 2007. Mindaribba LALC registered an interest in the assessment. DECC responded on 14 May 2007 to advise that 26 Aboriginal groups and/or individuals in addition to the relevant LALC should be contacted. The Registrar of Aboriginal Owners responded to advise that there are no Registered Aboriginal Owners for this area.

Compliance with Procedure #2 was achieved by writing to the 26 relevant groups on 21 May 2007 with an invitation to register their interest as per the DECC policy. Aboriginal and Historic Archaeological Solutions, Awabakal Descendants Traditional Owners Aboriginal Corporation, Awabakal Traditional Owners Aboriginal Corporation, Barkuma Neighbourhood Centre, Lower Hunter Wonnarua Council and Wonnarua Culture Heritage registered an interest.

Compliance with Procedure #3 was achieved by placing an advertisement in the Public Notices section of The Maitland Mercury on 14 May 2007, requesting any Aboriginal persons/organisations who may be interested in participating in the project to register their interest in writing. No additional responses to those noted above were received.

Compliance with Procedures #4 and 5 was achieved by writing on 14 June 2007 to the seven organisations that registered an interest providing them with a proposed methodology for the assessment for their consideration and comment by 9 July 2007. Bloomfield Collieries' Selection Criteria and request for insurance were also forwarded to the registered groups for completion with supporting documentation (eg. insurance certificates of currency) for those registrants wishing to be considered by Bloomfield for participation in the field survey.

Comments were received from the Mindaribba LALC regarding the proposed methodology, with the LALC in agreement with the proposal, although noting that procedures relating to the identification of skeletal material were not covered. The Awabakal Traditional Owners Aboriginal Corporation and Wonnarua Culture Heritage also responded to the methodology to indicate their satisfaction with it. These three organisations and the Lower Hunter Wonnarua Council responded to the selection criteria. Based on the responses to the selection criteria, Bloomfield Collieries engaged the Mindaribba LALC to provide assistance with the field survey.

Subsequent to this process an enquiry was received from Mr Arthur Fletcher, trading as "Wonn 1 Sites Officer", requesting information about the project. A copy of the methodology and selection criteria was sent to Mr Fletcher and a response to the selection criteria later received. Due to the absence of an initial registration of interest and a response to the selection criteria outside of the required time-frame, Bloomfield Collieries is treating Mr Fletcher as a party that registered an interest during the project and has been forwarded a copy of the draft report for comment.

Compliance with Procedure #6 was achieved by undertaking the field survey in consultation with the registered Aboriginal stakeholder selected by Bloomfield Collieries to participate in the survey, the Mindaribba LALC. Fieldwork was undertaken by Peter Kuskie and Caroline Ingram of South East Archaeology, assisted on 30 and 31 July 2007 by Jason Brown and Guy Patten, and on 1 and 2 August 2007 by Steven Talbot and Kelly Griffiths, representing the Mindaribba LALC. The representatives expressed satisfaction with the level of survey coverage and the consultation process, as well as an interest in the findings.

Compliance with Procedure #7 was achieved by providing copies of the draft heritage assessment report to the eight registered Aboriginal stakeholders, with a request for their comment.

Compliance with Procedure #8 was achieved through preparation of this final Aboriginal heritage impact assessment report that addresses and incorporates any input received from the registered Aboriginal stakeholders. Comments received are attached in Appendix 5.

Prior to the time the draft report had been completed and circulated to the registered stakeholders, correspondence was received by Bloomfield Colliery from Mrs Lea-Anne Ball, of the Lower Hunter Wonnarua Council (refer to Appendix 5). Mrs Ball expressed displeasure at not being involved in the field survey and not having received a draft report to provide comment on. Peter Kuskie (South East Archaeology) subsequently explained that a copy of the draft report would be forwarded when complete and the Lower Hunter Wonnarua Council's comments invited. This has subsequently occurred and further comment has not been provided by the Lower Hunter Wonnarua Council.

Mrs Ball noted the significance of the area to Wonnarua people and requested the opportunity to conduct a field survey of the area and develop a management plan for the artefacts found. As noted in Section 10 of this report, an Aboriginal Heritage Management Plan will be developed in consultation with the registered stakeholders that have sought further involvement in the assessment (including the Lower Hunter Wonnarua Council). As part of that process, an opportunity could be provided for the Lower Hunter Wonnarua Council to inspect the study area and sites located. Mrs Ball noted that until this occurs her organisation would oppose any s90 application.

Two responses were received from the registered Aboriginal stakeholders to the draft report, from the Awabakal Traditional Owners Aboriginal Corporation and the Mindaribba LALC (refer to Appendix 5).

Mrs Kerry Brauer of the Awabakal Traditional Owners Aboriginal Corporation recognised the comprehensive nature of the assessment but expressed concern that Aboriginal sites may not have been located during the "brief" time allocated for the survey and may still occur within the area. The comprehensive nature of the survey coverage has been documented within Section 5.1 of this report.

Mrs Brauer expressed desire for the final say in the relocation and storage of any artefacts retrieved and recommended should further objects be identified, work should cease until an assessment and salvage is undertaken. These issues are addressed in Section 10 of this report and the storage and curation of any salvaged artefacts will be discussed further with the other Aboriginal stakeholders during preparation of the Aboriginal Heritage Management Plan.

Mrs Brauer recommended that more reference should be made to Reverend Threlkeld's work (Gunson 1974) and disputed Tindale's (1974) assessment of tribal boundaries. South East Archaeology has undertaken extensive research into the cultural, ethnographical and ethnohistorical evidence of the region (refer to Kuskie and Kamminga 2000) including thorough review of the above-mentioned and numerous other key documents. Beyond key conclusions presented in Section 3 of this report, this information is not repeated further here.

Mrs Brauer asserted that the Aboriginal Land Rights Amendment Bill 2006 (actually the *Aboriginal Land Rights Amendment Act 2006 No 111*) specifies that persons with a cultural association with the land within the area of the LALC concerned must be consulted. It is not clear from Mrs Brauer's correspondence as to whom is to undertake the consultation and in relation to what specific activities, however the above-mentioned Act, although assented to in December 2006, contains provisions that are yet to be enacted within the *Aboriginal Land Rights Act 1983*. Review of the in-force *Aboriginal Land Rights Act 1983* does not substantiate the above claim, in relation to the present Aboriginal heritage impact assessment process. In relation to the present assessment, the consultation processes required by DECC and DOP have been implemented as documented in this report. It is important to note that Section 52 (Functions of Local Aboriginal Land Councils) of the *Aboriginal Land Rights Act 1983* contains the following key sub-section in relation to culture and heritage, that is of direct relevance to the present Aboriginal heritage impact assessment:

(4) Aboriginal culture and heritage

A Local Aboriginal Land Council has the following functions in relation to Aboriginal culture and heritage:

(a) to take action to protect the culture and heritage of Aboriginal persons in the Council's area, subject to any other law,
(b) to promote awareness in the community of the culture and heritage of Aboriginal persons in the Council's area.

Mr Rick Griffiths, on behalf of the Mindaribba LALC, indicated satisfaction with the draft heritage report and survey procedures. The Mindaribba LALC endorsed the recommendations of the draft report and requested that scope be provided to review and amend the Aboriginal Heritage Management Plan where necessary, that ongoing consultation occurs with the LALC, and that plant operators and staff working at Bloomfield are inducted with respect to cultural heritage.

Recommendations are presented in Section 10 to address the issues raised by the Aboriginal stakeholders, which will primarily be addressed through preparation of an Aboriginal Heritage Management Plan in consultation with the three organisations that have sought further involvement in the assessment (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation).

7. SIGNIFICANCE ASSESSMENT

7.1 Criteria

The information contained within this report, along with an assessment of the significance of the Aboriginal heritage evidence, provides the basis for the Department of Environment and Climate Change (DECC) to make informed decisions regarding the management and degree of protection which should be afforded to specific Aboriginal heritage sites.

The significance of Aboriginal heritage evidence can be assessed along the following criteria, widely used in Aboriginal heritage management, derived from the relevant aspects of the ICOMOS Burra Charter and 'State Heritage Inventory Evaluation Criteria and Management Guidelines':

I. Scientific (Archaeological) value;
II. Importance to Aboriginal people (Cultural value);
III. Educational value;
IV. Historic value; and
V. Aesthetic value.

Greater emphasis is generally placed on scientific and cultural criteria when assessing the significance of Aboriginal heritage evidence in Australia.

SCIENTIFIC (ARCHAEOLOGICAL) VALUE:

Scientific value refers to the potential usefulness of heritage evidence to address further research questions, the representativeness of the evidence, the nature of the evidence and its state of preservation.

Research Potential:

Research potential refers to the potential for information derived from further investigation of the evidence to be used for answering current or future research questions. Research questions may relate to any number of issues concerning past human culture, human behaviour generally or the environment. Numerous locations of heritage evidence have research potential. The critical issue is the threshold level, at which the identification of research potential translates to significance/importance at a local, regional or national level.

Several key questions can be posed for each location of heritage evidence:

- Can the evidence contribute knowledge not available from any other resource?
- Can the evidence contribute knowledge, which no other such location of evidence can?
- Is this knowledge relevant to general questions about human history, past environment or other subjects?

Assessing research potential therefore relies on comparison with other evidence in local and regional contexts. The criteria used for assessing research potential include the:

a) potential to address locally specific research questions;
b) potential to address regional research questions;
c) potential to address general methodological or theoretical questions;
d) potential deposits; and
e) potential to address future research questions.

In terms of meeting a threshold level to have significant research potential, the particular questions asked of the evidence should be able to contribute knowledge that is not available from other resources or evidence (either on a local or regional scale) and are relevant to general questions about human history, past environment or other subjects.

Representativeness:

Representativeness is generally assessed at local, regional and national levels. It is an important criterion, because the primary goal of cultural resource management is to afford greatest protection to a representative sample of Aboriginal heritage evidence throughout a region. The more unique or rare evidence is, the greater its value as being representative within a regional context.

The main criteria used for assessing representativeness include:

a) the extent to which the evidence occurs elsewhere in the region;
b) the extent to which this type of evidence is subject to existing or potential future impacts in the region;
c) the integrity of the evidence compared to that at other localities in the region;
d) whether the evidence represents a prime example of its type within the region; and
e) whether the evidence has greater potential for educational or demonstrative purposes than at other similar localities in the region.

Nature of Evidence:

The nature of the heritage evidence is related to representativeness and research potential. The less common the type of evidence is, the more likely it will have representative value. The nature of the evidence is directly related to its potential to be used in addressing present or future research questions. Criteria used in assessing the nature of the evidence include the:

a) presence, range and frequency of stone materials;
b) presence, range and frequency of artefact types; and
c) presence and types of other features.

A broader range of stone and artefact types generally equates to the potential for information to address a broader range of research questions. The presence of non-microlith and microlith tool types also equates to higher potential to address relevant research questions. The presence and frequency of particular stone or artefact types or other features also has relevance to the issue of representativeness (eg. a rare type may be present).

Integrity:

The state of preservation of the evidence (integrity) is also related to representativeness and research potential. The higher the integrity of evidence, the greater the level of scientific information likely to be obtained from its further study. This translates to greater importance for the evidence within a local or regional context, as it may be a suitable example for preservation within a sample representative of the entire cultural resources of a region.

The criteria used in assessing integrity include:

a) horizontal and vertical spatial distribution of artefacts;
b) preservation of intact features such as midden deposits, hearths or knapping floors;
c) preservation of site contents such as charcoal and shell which may enable accurate direct dating or other analysis; and
d) preservation of artefacts which may enable use-wear/residue analysis.

Generally, many of these criteria can only be applied to evidence obtained by controlled excavation. High levels of ground disturbance limit the possibility that the evidence would surpass the threshold of significance on the basis of integrity (ie. the area would be unlikely to possess intact spatial distributions, intact features, *in situ* charcoal or shell, etc).

ABORIGINAL (CULTURAL) SIGNIFICANCE:

Aboriginal (cultural) significance refers to the value placed upon Aboriginal heritage evidence by the local Aboriginal community.

All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Heritage evidence may be part of contemporary Aboriginal culture or be significant because of its connection to spiritual beliefs or as a part of recent Aboriginal history.

Consultation with the local Aboriginal community is essential to identify the level of Aboriginal significance. The significance of the identified sites was discussed with representatives of the local Aboriginal community.

EDUCATIONAL VALUE:

Educational value refers to the potential of heritage evidence to be used as an educational resource for groups within the community.

HISTORIC VALUE:

Historic value refers to the importance of heritage evidence in relation to the location of an historic event, phase, figure or activity.

AESTHETIC VALUE:

Aesthetic value includes all aspects of sensory perception. This criterion is mainly applied to art sites or mythological sites.

7.2 Significance of Heritage Evidence Within the Study Area

The Aboriginal heritage sites Bloomfield B2, B16, B18, B19, B20 and B22 do not surpass the threshold for significance in terms of educational, historic or aesthetic value.

All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Consultation with members of the local Aboriginal community was undertaken to assist with identification of the level of Aboriginal significance. Members of the Mindaribba LALC expressed their interest in the identified evidence and its cultural value.

In acknowledgment that the Aboriginal community themselves are in the best position to identify levels of cultural significance (Appendix 5), the remainder of this assessment focuses on the potential scientific values of the heritage evidence. The statement of scientific significance is in no way intended to prioritise scientific values over cultural values or to lessen the importance of the views of the Aboriginal community.

Sites B2, B16, B18, B19, B20 and B22 are assessed as being of low scientific significance within a local context and low scientific significance within a regional context on the basis that:

- The sites are of low representative value within a regional context. Similar evidence exists elsewhere throughout the Hunter Valley and the identified artefacts do not represent rare or unusual types;
- The sites generally exhibit a limited range of artefact and stone material types and artefacts occur at a very low density;
- The sites have been substantially affected by post-depositional processes, particularly the extensive vegetation clearance works and earthmoving works, and are consequently of low integrity; and
- Also as a result of the extensive levels of ground disturbance, there is limited potential for further heritage evidence to occur in the form of artefact deposits that are *in situ* and/or of research value.

8. STATUTORY OBLIGATIONS

The *National Parks and Wildlife Act 1974* (as amended) provides the primary basis for the legal protection and management of Aboriginal heritage sites within NSW. Implementation of the Aboriginal heritage provisions of this Act is the responsibility of the Climate Change and Environment Protection Group and Cultural Heritage Divisions of the Department of Environment and Climate Change (NSW) (DECC). The rationale behind the Act is to prevent unnecessary or unwarranted destruction of Aboriginal objects and to protect and conserve objects where such action is considered warranted.

With the exception of some artefacts in collections, the Act generally defines all Aboriginal objects to be the property of the Crown. The Act then provides various controls for the protection, management and destruction of these objects. An 'Aboriginal object' is defined as

> 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains' [Section 5(1)].

In practice, archaeologists generally subdivide the legal category of 'object' into different site types, which relate to the way Aboriginal heritage evidence is found within the landscape. The archaeological definition of a 'site' may vary according to survey objectives, however it should be noted that even single and isolated artefacts are protected as objects under the Act.

Under the terms of the *National Parks and Wildlife Act 1974*, it is an offence for a person to:

- Knowingly destroy, damage or deface an Aboriginal object or place, or knowingly cause or permit the destruction, defacement or damage to an Aboriginal object or place, without first obtaining the consent of the Director-General of DECC;
- Disturb or excavate any land, or cause any land to be disturbed or excavated, for the purpose of discovering an object, without first obtaining the consent of the Director-General of DECC; and
- Collect on any land an object that is the property of the Crown, other than an object under the control of the Australian Museum, without obtaining appropriate authorisation from the Director-General of DECC.

Penalties for infringement of the Act include up to 50 penalty units or imprisonment for six months, or both (or 200 penalty units in the case of a corporation).

Consents regarding the use or destruction of objects are managed through a DECC permit system. The issuing of permits is dependent upon adequate archaeological assessment and review, together with an appropriate level of Aboriginal community liaison and involvement. To excavate or disturb land for the purposes of discovering an Aboriginal object, approval of a Section 87 'Preliminary Research Permit' application is typically required. To enable unmitigated destruction of objects, a 'Section 90 Consent' must normally be obtained (apart from Part 3A Major Projects). To enable the mitigated destruction of objects, involving measures such as collection and/or salvage excavation, a 'Section 90 Consent with Salvage Permit' is normally required. The Director-General may attach any terms and conditions seen fit to any Consent granted for the above activities. Failure to comply with a term or condition is deemed to be a contravention of the Act.

An appeals process is available whereby an applicant, dissatisfied with the refusal of the Director-General to grant Consent, or with any conditions or restrictions attached to Consent, may appeal to the Minister. The Minister may refuse to grant an appeal or partially or wholly grant an appeal. The decision of the Minister on the appeal is final and is binding on the Director-General and the appellant.

The Minister also has substantial powers under Section 12 to direct DECC to carry out works and activities, either generally or in a particular case, in relation to the identification, conservation and protection of, and prevention of damage to, Aboriginal objects and places.

Under the *National Parks and Wildlife Act 1974*, 'Aboriginal areas' may also be declared over private land, where Aboriginal objects or places are located, with the consent of the owner or occupier. The purpose of reserving land as an 'Aboriginal area' is to identify, protect and conserve areas associated with a person, event or historical theme, or containing a building, place, object, feature or landscape of natural or cultural significance to Aboriginal people, or of importance in improving public understanding of Aboriginal culture and its development and transitions (Section 30K).

Under Section 91AA of the Act, if the Director-General is of the opinion that any action is being, or is about to be carried out that is likely to significantly affect an Aboriginal object or Aboriginal place or any other item of cultural heritage situated on land reserved under the Act, the Director-General may make a stop-work order for a period of 40 days. A person that contravenes a stop-work order may be penalised up to 1,000 penalty units and an additional 100 units for every day the offence continues (10,000 units and 1,000 units respectively in the case of a corporation).

Under the Part 3A Major Project amendments to the *Environmental Planning and Assessment Act 1979* (EP&A Act), subsequent to approval being granted, Section 90 Consent under the *National Parks and Wildlife Act 1974* may not be required to impact Aboriginal objects. *In lieu* however, a Part 3A application involving a Statement of Commitments outlining proposed heritage management and mitigation measures must be approved.

While the primary legislation offering protection to Aboriginal heritage in NSW is enacted by the state, several Acts administered by the Commonwealth may also be relevant.

The *Aboriginal and Torres Strait Islander Heritage Protection Act, 1984*, provides for the protection of areas and objects which are of significance to Aboriginal people in accordance with Aboriginal tradition. The Act allows Aboriginals to apply to the Minister to seek protection for significant Aboriginal areas and objects. The Minister has broad powers to make such a declaration should the Minister be satisfied that the area or object is a significant Aboriginal area or object and is under immediate threat of injury or desecration. An 'emergency declaration' can remain in force for up to thirty days. It is an offence under the Act to contravene a provision of a declaration. Provisions are made for penalties of up to $50,000 for a corporation found guilty of contravening the Act and up to $10,000 and imprisonment for a maximum of five years, for a person found guilty of contravening the Act.

Under the Act, 'Aboriginal tradition' means:

> 'the body of traditions, observances, customs and beliefs of Aboriginals generally or of a particular community or group of Aboriginals, and includes such traditions, observances, customs or beliefs relating to particular persons, areas, objects or relationships' (Section 3).

A ‘significant Aboriginal area’ refers to:

> An area of land or water in Australia being of 'particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3).

A ‘significant Aboriginal object’ refers to:

> An object (including Aboriginal remains) of ‘particular significance to Aboriginals in accordance with Aboriginal tradition' (Section 3).

For the purposes of the Act, an area or object is considered to be injured or desecrated if:

> a) in the case of an area, it is used or treated in a manner inconsistent with Aboriginal tradition; or the use or significance of the area in accordance with Aboriginal tradition is adversely affected by reason of anything done in or near the area; or passage through or over, or entry upon the area by any person occurs in a manner inconsistent with Aboriginal tradition; and
>
> b) in the case of an object, it is used or treated in a manner inconsistent with Aboriginal tradition (Section 3).

A new national heritage system commenced on 1 January 2004, largely replacing the previous *Australian Heritage Commission Act 1975*. Its primary features under the amended *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) and the *Australian Heritage Council Act 2003* include:

- A National Heritage List of places of national heritage significance;
- A Commonwealth Heritage List of heritage places owned or managed by the Commonwealth;
- Creation of the Australian Heritage Council – an independent expert body to advise the Minister on the listing and protection of heritage places; and
- Continued management of the Register of the National Estate, a list of more than 13,000 heritage places around Australia that has been compiled by the former Australian Heritage Commission since 1976.

The study area does not contain any heritage items registered for indigenous values under the Acts listed above, with the exception of the Aboriginal objects protected under the *National Parks and Wildlife Act 1974*.

Under the *Environmental Planning and Assessment Act 1979* (EP&A Act) the Minister may make various planning instruments such as Regional and Local Environment Plans. The *Cessnock Local Environmental Plan 1989* (LEP) applies to the study area, although may not be relevant to this specific project if it is defined as an activity under Part 3 or Part 5 of the EP&A Act. The plans set out objectives and controls for the development of land in this area.

The *Cessnock Local Environmental Plan 1989* is administered by Cessnock City Council and contains several provisions relating to indigenous heritage, under Sections 36-42 and Schedule 3. Under the LEP, "relic" means any deposit, object or material evidence relating to the settlement (including Aboriginal habitation) prior to 1 January 1900 of the area of the City of Cessnock. No indigenous heritage items are listed on Schedule 3 of the Cessnock LEP within the present study area. However, the artefact scatter sites identified during the present investigation may be subject to the relevant provisions of the LEP.

In respect to the development of heritage items, Section 36 of the *Cessnock Local Environmental Plan 1989* specifies that:

(1) A person shall not, in respect of a building, work, relic or place that is an item of the environmental heritage -

(a) demolish, renovate or extend that building or work;
(b) damage or despoil that relic or place or any part of that relic or place;
(c) excavate any land for the purpose of exposing or removing that relic;
(d) erect a building on the land on which that building, work or relic is situated or the land which comprises that place; or
(e) subdivide the land on which that building, work or relic is situated or the land which comprises that place,

except with the consent of the Council.

(2) The Council shall not grant that consent unless it has made an assessment of -

(a) the significance of the item as an item of the environmental heritage of the City of Cessnock;
(b) the extent to which the carrying out of the development in accordance with the consent would affect the historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the item and its site;
(c) whether the setting of the item and, in particular, whether any stylistic, horticultural or archaeological features of the setting should be retained; and
(d) whether the item constitutes a danger to the users or occupiers of that item or to the public.

9. MITIGATION AND MANAGEMENT STRATEGIES

The Aboriginal heritage assessment reported herein has been commissioned in relation to the Part 3A Major Project application lodged by Bloomfield Collieries for the completion of open-cut coal mining and rehabilitation of areas within Mining Lease CCL761. The application area is marked on Figures 2 and 3 and includes all of the Mining Operations Plan approved area, as well as the workshop area, access road to the workshop and the haul road from the active mining area to the washery ROM coal stockpile pad.

A total of six Aboriginal heritage sites, all stone artefact occurrences, comprising nineteen loci of identified evidence, have been recorded within the 108 hectare unmodified portion of the study area (Figure 5). However, the remaining 210 hectares of the study area comprises land that has been extensively impacted by earthmoving works and building, such that there is negligible potential for any Aboriginal heritage evidence to survive (Figure 4).

The identified artefact evidence occurs in a very low density distribution. Further artefacts are expected to occur across the unmodified study area in a distribution and density consistent with the survey results. However, notwithstanding that shallow deposits may be present in some forested areas or along the drainages where A unit soil may have been retained, the potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value is low to very low. Other types of heritage evidence (eg. scarred trees and grinding grooves) are not anticipated to occur within the unmodified study area (ie. very low or negligible potential) and other Aboriginal cultural values or associations have not been identified.

The completion of open-cut coal mining and rehabilitation activities are anticipated to involve earthmoving works and, in the absence of mitigation measures, will result in impacts to virtually all of the identified heritage evidence within the unmodified study area.

Strategies for the management of the identified and potential Aboriginal heritage resources within the study area are presented below. A key consideration in selecting a suitable strategy is the recognition that Aboriginal heritage is of primary importance to the local Aboriginal community, and that decisions about the management of the sites should be made in consultation with the registered Aboriginal stakeholders.

Strategy 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 or sediment deposition), sub-surface testing may be an appropriate strategy to further assess the site. Testing is also appropriate in locations where artefact or midden deposits are predicted to occur through application of a 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 auger holes, shovel pits, mechanically excavated trenches or surface scrapes. A Section 87 Permit is generally required from DECC to undertake sub-surface testing, unless Part 3A approval has been granted and i*n lieu* a Statement of Commitments outlining such measures has been approved. Approval of a Section 87 Permit can take up to eight weeks, following receipt by DECC 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 DECC. Consultation is also required with the relevant Aboriginal stakeholders as per the relevant DECC policy.

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 - E) can be applied.

In relation to the unmodified study area, the requirement for further investigation by sub-surface testing is limited by:

- The widespread high levels of existing ground disturbance;
- The results of the survey, indicating a very low density of artefact evidence within the study area;
- The model of Aboriginal occupation for the locality, supported by the survey results, indicating that Aboriginal occupation of the unmodified study area was of a low intensity, and probably related to transitory movement through the landscape and hunting/gathering by small groups of people during the course of the normal daily round; and
- Consequent low to very low potential for sub-surface deposits of artefacts, particularly deposits that may be *in situ* and/or of research value.

Strategy B: Conservation:

The suitability of conservation as a management option has long been recognised. This strategy is suitable for all heritage sites, but particularly those of high archaeological significance and/or high cultural significance. Conservation is also highly appropriate for specific archaeological resources and environmental/cultural contexts, as part of a regional strategy aimed at conserving a representative sample of identified and potential heritage resources.

Options exist within development proposals that can be utilised for the conservation of identified or potential Aboriginal heritage resources, including exclusion of development from zones of high heritage significance or potential, or preservation of areas within formal conservation zones.

In relation to the present study area, the imperative for implementing formal conservation measures for Aboriginal heritage is limited by the factors listed above, including the high levels of ground disturbance, low to very low potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value, limited representative value of the evidence and very low cumulative impacts of the proposal, along with the low scientific significance of the identified evidence.

Strategy C: Mitigated Impact (Salvage):

In circumstances where a site 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 archaeological study of Aboriginal occupation, the strategy of salvage can be considered.

Salvage may include the collection of surface artefacts or systematic excavation of artefact or midden deposits, normally as part of a Section 90 Consent with Salvage Permit obtained from DECC. This strategy is the primary means of minimising impacts to Aboriginal heritage from development projects where the option of conservation is not feasible.

The specific aims of any salvage project and the methodology could only be finalised after consultation with the Aboriginal stakeholders and DECC, in relation to an application for a Section 90 Consent with Salvage Permit. The application would need to address the views and policy and legislative requirements of these key stakeholders. Consultation is required with the relevant Aboriginal stakeholders as per the relevant DECC policy. Alternatively, if a Part 3A approval is granted, Section 90 Consent may not be required but i*n lieu* a Statement of Commitments outlining proposed heritage management and mitigation measures must be approved.

In relation to the current study area, given the presence of identified Aboriginal objects protected under the *National Parks and Wildlife Act 1974*, either a Section 90 Consent or Part 3A approval is required prior to any impacts occurring to those objects. As outlined above, in consideration of the high levels of ground disturbance, low to very low potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value, limited representative value of the evidence and low scientific significance of the identified evidence, mitigated impact is a feasible option should the Aboriginal stakeholders request mitigation measures to reduce the impacts of the proposal on the cultural values of the artefact evidence. An appropriate mitigation strategy would be the surface collection of identified artefacts prior to any impacts occurring. This approach has been endorsed by several of the registered Aboriginal stakeholders (refer to Section 6 and Appendix 5).

Strategy D: Unmitigated Impact:

The strategy of unmitigated impact involves the proponent making application to DECC for a Section 90 Consent for any known Aboriginal objects that will be affected by a proposal. This Consent must normally be obtained prior to the commencement of works affecting the evidence, because all objects are protected under the terms of the *National Parks and Wildlife Act 1974*. Alternatively, if a Part 3A approval is granted, Section 90 Consent may not be required, but i*n lieu* a Statement of Commitments outlining proposed heritage management and mitigation measures must be approved.

The support of the Aboriginal stakeholders should be obtained, through further liaison, for any Section 90 Consent application or Part 3A Statement of Commitments. Consultation is required with the local Aboriginal community as per the relevant DECC policy. DECC guarantees to process applications within eight weeks, subject to receipt of all necessary information. This strategy is typically suitable when a site is of low scientific significance, the local Aboriginal community holds no objections, and it is unfeasible to implement any other strategy.

In relation to the current study area, given the presence of identified Aboriginal objects protected under the *National Parks and Wildlife Act 1974*, either a Section 90 Consent or Part 3A approval is required prior to any impacts occurring to those objects. Given the high levels of ground disturbance, low to very low potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value, limited representative value of the evidence and low scientific significance of the identified evidence, unmitigated impact is a feasible option subject to the views of the Aboriginal stakeholders. Correspondence received from several of the registered Aboriginal stakeholders (refer to Section 6 and Appendix 5) indicates that unmitigated impact would not be acceptable.

Strategy E (Monitoring):

An alternative strategy for zones where archaeological deposits are predicted to occur is to monitor construction, particularly any initial earthmoving and soil removal works, for the presence of artefacts, shell or skeletal remains.

Monitoring is the primary strategy for managing the possible occurrence of Aboriginal skeletal remains. Monitoring for the presence of shell and stone artefacts is also often of value to the Aboriginal community, who may be seeking to identify and salvage material that was not visible on the surface during a preliminary study. The sieving of graded deposits is also a practical measure that enhances the benefits of monitoring for artefacts.

Monitoring for artefacts (in preference to sub-surface testing) is not a widely accepted method within the context of a scientific 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 cultural or scientific significance. However, when Development Consent or Part 3A Approval is granted, monitoring for the presence of artefacts and other features during initial earthworks can be of scientific benefit and benefit to the Aboriginal community. Monitoring undertaken in this circumstance may enable the identification and retrieval of cultural evidence that may not otherwise have been recorded or salvaged.

In relation to the present study area, considering the low potential for skeletal remains, monitoring is not required for this purpose. Considering the high levels of ground disturbance, low to very low potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value, and very low density nature of the artefact evidence, monitoring does not represent a suitable strategy as a final salvage measure after Development Consent or Part 3A Approval is granted.

10. RECOMMENDATIONS

The Aboriginal heritage assessment reported herein has been commissioned in relation to the Part 3A Major Project application lodged by Bloomfield Collieries for the completion of open-cut coal mining and rehabilitation of areas within Mining Lease CCL761 (Figures 2 and 3).

Six Aboriginal heritage sites, all stone artefact occurrences, comprising nineteen loci of identified evidence, have been recorded within the study area and may be impacted by the proposal (Figure 5). A very low density distribution of artefacts may occur across the unmodified portion of the study area, however the potential for sub-surface deposits of artefacts that may be *in situ* and/or of research value is low to very low. Other types of heritage evidence are not anticipated to occur within the study area and other Aboriginal cultural values or associations have not been identified during the course of the assessment. In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the proposal on Aboriginal heritage will be low.

The following management and mitigation measures are proposed, with consideration of legal requirements under the NSW *National Parks and Wildlife Act 1974* and *Environmental Planning and Assessment Act 1979*, the results of the survey and consultation with the local Aboriginal community:

- An Aboriginal Heritage Management Plan must be formulated in consultation with the registered Aboriginal stakeholders who have sought further involvement in the project (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation), prior to any development impacts occurring, to specify the policies and actions required in every conceivable circumstance to mitigate and manage the potential impacts of the proposal on Aboriginal heritage after Part 3A approval is granted. The plan will include procedures for ongoing Aboriginal consultation and involvement, mitigation measures for the identified and potential Aboriginal evidence, management procedures for any previously unrecorded evidence and skeletal remains, cultural awareness training for mine staff and contractors, and review of the plan. The Plan will comprise a detailed Statement of Commitments that, subject to Part 3A project approval, will guide management of the Aboriginal heritage resource *in lieu* of a Section 90 Consent. The primary elements of the Plan are outlined below:

    - In order to mitigate the impacts of development upon the cultural and scientific values of the identified and potential heritage evidence and to retrieve and conserve samples of evidence, a program of salvage will be undertaken within the development impact area. This will involve representatives of the registered Aboriginal stakeholders collecting identified stone artefacts from sites B2, B16, B18, B19, B20 and B22 prior to any development impacts occurring; and

    - Should any skeletal remains be detected during the course of development, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, DECC and Mindaribba LALC;

- Further consultation will be pursued with the registered Aboriginal stakeholders who have sought further involvement in the project (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation) in relation to the proposal and the contents and recommendations of this investigation. The continued involvement of these registered Aboriginal stakeholders in the ongoing management of the heritage resource within the study area will be promoted;

- Under the terms of the *National Parks and Wildlife Act 1974* it is an offence to knowingly destroy, damage or deface an Aboriginal object without obtaining the prior written permission of the Director-General of DECC. Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report and marked on Figure 5, in the absence of a valid Section 90 Consent or *in lieu*, Part 3A approval;

- Single copies of this report should be forwarded to the Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation; and

- Three copies of this final report should be forwarded to:

  Manager
  North Branch
  Climate Change and Environment Protection Group
  Department of Environment and Climate Change (NSW)
  Locked Bag 914
  Coffs Harbour NSW 2450.

After implementation of these management and mitigation measures, it is concluded that the risk of residual impacts to Aboriginal heritage from the proposal will be very low.

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ACKNOWLEDGEMENTS

The consultant wishes to acknowledge the assistance of the following people:

- Steve Dunn, Simon Grassby, Lachlann Crawford and staff, Bloomfield Collieries Pty Ltd;
- Nicole Croker, Business Environment;
- Lea-Anne Ball, Lower Hunter Wonnarua Council;
- Kerrie Brauer, Awabakal Traditional Owners Aboriginal Corporation; and
- Rick Griffiths, Steven Talbot, Kelly Griffiths, Jason Brown, Guy Patten and members of the Mindaribba Local Aboriginal Land Council.

DISCLAIMER

The information contained within this report is based on sources believed to be reliable. Every effort has been made to ensure accuracy by using the best possible data and standards available. The accuracy of information generated during the course of this field investigation is the responsibility of the consultant.

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