10 MANAGEMENT RECOMMENDATIONS

The management recommendations presented in this section are based on-

- The provisions of the National Parks and Wildlife Act 1974.
- Advice from Birpai and Bunyah Local Aboriginal Land Council representatives.
- A review and re-inspection of sites recorded during the 1996 survey and reassessment of these sites in terms of the revised development concept plan.
- Results of the field inspection conducted in the southern extension area.
- A consideration of the potential impact of the development proposal on Aboriginal cultural heritage sites and values.

10.1 Site 1: Artefact scatter/Open campsite (#30-6-106)

Site 1 would not be directly affected by the amended development proposal (Figure 2).

Providing the site area is spared any development-related disturbance and is retained in its present condition, no management action is warranted. The site has naturally stabilised since its 1996 recording and the previously recommended artificial stabilisation works are thus no longer necessary.

10.2 Site 2: Artefact scatter/Open campsite (#30-6-107)

Site 2 would not be directly affected by the amended development proposal (Figure 2).

Providing the site area is spared any development-related disturbance and is left to regenerate, no management action is warranted. However, to achieve a conservation

outcome, it is imperative that any track upgrading works associated with the provision of pedestrian access to Rainbow Beach be exclusively confined to the existing track alignment shown on Figure 2.

10.3 Site 3: Artefact scatter/Open campsite (#30-6-108)

The southern section of Site 3 ('location 1') would not be affected by the amended development proposal (Figure 2). However, Site 3 'location 2' is intercepted by a proposed roadway and would be destroyed as a result of its construction.

Although no longer detectable, nine stone artefacts were recorded in a drain cutting at a depth of 20 centimetres at 'location 2' in 1996. This area clearly has the potential to contain undisturbed subsurface evidence of archaeological research value. In view of this potential, and given that it would be destroyed if the development proceeds as planned, it is recommended that the Site 3 'location 2' impact area (cf Figure 3) be subject to an archaeological test investigation to assess the content, stratigraphic/disturbance context and significance of subsurface evidence, and to determine any requirement for permanent conservation or more comprehensive recording/salvage prior to destruction.

10.4 Site 4: Artefact scatter/Open campsite (#30-6-109)

The majority of Site 4 lies within an area proposed for construction of artificial wetlands. The site is the largest and most extensive of those recorded at Rainbow Beach and the topographically intact (but cleared) sand rise west of the artefact exposure recorded in 1996 has a high probability of containing a well-preserved archaeological deposit. Given that few other similar sites have been recorded in the local and regional area, Site 4 is assessed to have a high level of archaeological/scientific significance. This significance is considered sufficient to warrant the site's permanent conservation.

To preserve the Aboriginal social and archaeological/scientific values of Site 4, it is recommended that all land above the six metre contour interval (as shown on Figure 3) be excluded from the proposed wetlands and retained in its present condition. It is desirable that cattle grazing be immediately discontinued in the Site 4 area to facilitate vegetation regeneration and natural surface stabilisation.

To ensure that significant archaeological deposits are not inadvertently disturbed or destroyed, it is recommended that temporary fencing be erected and maintained along the six metre contour interval adjacent to Site 4 (Figure 3) to define the 'no-go' area for the duration of wetlands construction. No disturbance may occur above the Site 4 six metre contour interval without formal approval from the Department of Environment and Conservation.

10.5 Site 5: Isolated find (#30-6-110)

Site 1 would not be affected by the amended development proposal (Figure 2).

Providing the site area is spared any development-related disturbance and is retained in its current condition, no management action is warranted.

10.6 Site 6: Artefact scatter/Open campsite (#30-6-111)

10.7 Site 7: Artefact scatter/Open campsite (#30-6-112)

In tandem with Site 3 'location 2', Sites 6 and 7 are probably representative of a relatively dense 'background' distribution of reduced beach pebbles occurring beneath alluvial sediments in the non flood-prone eastern section of the study area. As with those at Site 3 'location 2', artefacts at Sites 6 and 7 were exposed in a drain cutting, strongly suggesting further subsurface archaeological and research potential for the surrounding alluvium.

Owing to this potential, and given that Sites 6 and 7 would be destroyed if the development proceeds as planned, it is recommended that (the apparently more topographically intact) alluvial plains east of the subject drain (cf Figure 3) be subject to an archaeological test investigation to assess the content, stratigraphic/disturbance context and significance of subsurface evidence, and to determine any requirement for permanent conservation or more comprehensive recording/salvage prior to destruction. To date, no subsurface investigations have been conducted in alluvial contexts in the Hastings region and any information generated by this investigation would be of both specific site and regional research and agency management value.

10.8 Site 8: Artefact scatter/Open campsite (#30-6-113)

Site 8 would not be affected by the amended development proposal (Figure 2).

Providing the site area is spared any development-related disturbance and is retained in its current condition, no management action is warranted.

10.9 Site 9: Isolated find (#30-6-114)

Site 9 would not be affected by the amended development proposal (Figure 2).

Providing the site area is spared any development-related disturbance and is retained in its current condition, no management action is warranted.

10.10 Site 10: Artefact scatter/Open campsite (#30-6-115)

Site 10 is intercepted by a proposed roadway and would be destroyed as a result of its construction (Figure 2). Although no longer detectable due to regenerating grass cover, 14 surface artefacts were recorded on erosion exposures in 1996, and additional materials are expected beneath aggrading sands in the site locality.

In view of its further archaeological potential, and given that it would be destroyed if the development proceeds as planned, it is recommended that the Site 10 impact area (cf Figure 3) be subject to an archaeological test investigation to assess the content, stratigraphic/disturbance context and significance of subsurface evidence, and to determine any requirement for permanent conservation or more comprehensive recording/salvage prior to destruction. The investigation offers the potential to provide information on the archaeology of an inner barrier open beach deposit that would be of both research and agency management value.

10.11 Site 12: Artefact scatter/Open campsite

Site 12 lies within an area proposed for the possible construction of a roadway to the top of the outlying knoll on the south-east study boundary. This site is of high significance to the Bunyah LALC and has further archaeological potential.

To preserve its Aboriginal social and archaeological/scientific values, it is recommended that Site 12 be conserved in its present environment, and that any future road construction disturbance on the western face of the knoll be confined to the existing downcut track easement shown in Plate 8 and highlighted on Figure 3.

The site is located within regrowth oak forest that stands on the western knoll footslope north from the existing downcut track. In the absence of an appropriate DEC Heritage Impact Permit it will be necessary to protect this forest from development-related impact.

10.12 Rainbow Beach midden (#30-6-12)

The existing Rainbow Beach access track that may be upgraded for use by subdivision residents passes through the general locality of the Site #30-6-12 midden recorded by Starling in 1970. This track is cut down through the dune and despite search of its surface

and cuttings, and the seaward scarp of the wider foredune in 1996, the closest midden shell was found some 200 metres further north.

Although the site has degraded as a result of beach erosion and natural attrition processes (cf Starling 1971; Happ and Bowdler 1983; Collins 1996), shell and stone artefacts may remain bedded within undisturbed parts of the foredune. In order to avoid inadvertent damage to the surviving remnants of Site #30-6-12, it is recommended that all upgrading works (eg the provision of a chained plank walkway etc) be confined to the easement defined by the existing track cutting.

10.13 General recommendations

Prior to the commencement of any vegetation clearing, earthworks or other invasive development-related activities, it is recommended that all construction contractors be advised of their legal obligations with regard to Aboriginal cultural materials (cf Section 8).

Should any material evidence thought to be of Aboriginal origin be discovered or exposed during any stage of the development, work must immediately cease in that locality. The Department of Environment and Conservation and the Birpai and/or Bunyah Local Aboriginal Land Council (as appropriate) should then be contacted for management advice and clearance given by these organisations before work resumes in the subject area.

10.14 Conclusion

Providing all of the recommendations presented in Sections 10.1-10.13 above are adhered to, it is recommended that the proposed development be allowed to proceed without further Aboriginal heritage constraints.

Table 3. Summary of site management recommendations

Site #	DEC site #	# surface artefacts	Potential to extend	Scientific significance	Affected 1996	1996 management recommendation	Affected by revised concept	Current management recommendation
Sites recorded in 1996								
1	30-6-106	20	Yes	Moderate	No	Stabilise and retain in situ	No	Avoid disturbance- retain in situ Stabilisation works no longer necessary
2	30-6-107	5	Limited	Low	No	Avoid disturbance- retain in situ	No	Avoid disturbance- retain in situ
3	30-6-108	11	Yes	Moderate	No	Avoid disturbance- retain in situ	Part	Subsurface investigation in impact area
4	30-6-109	115	Yes	High	No	Stabilise and retain in situ	Yes	Modify concept plan Avoid disturbance- retain in situ Construction fencing along 6m contour Stabilisation works no longer necessary
5	30-6-110	1	No	Low	Yes	Collect before development	No	Avoid disturbance- retain in situ
6	30-6-111	2	Yes- probably limited	Moderate	Yes	Subsurface investigation	Yes	Subsurface investigation
7	30-6-112	2	Yes- probably limited	Moderate	Yes	Subsurface investigation	Yes	Subsurface investigation
8	30-6-113	3	Limited	Low	Yes	Collect before development	No	Avoid disturbance- retain in situ
9	30-6-114	1	No	Low	No	Avoid disturbance- retain in situ	No	Avoid disturbance- retain in situ
10	30-6-115	14	Yes	Moderate	No	Avoid disturbance- retain in situ	Yes	Subsurface investigation
Newly recorded sites								
12	n/a	11	Yes	Moderate	No	n/a	Possible direct or indirect impact	Avoid disturbance- retain in situ
Rainbow Beach midden								
n/a	30-6-012	n/a	Yes	Undetermined	Potential	Confine disturbance to existing beach track cutting	Potential	Confine disturbance to existing beach track cutting

Figure 3. Location of sites/areas recommended for specific management actions
(excerpt from the Figure 2 concept plan, enlarged by 100%)

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GLOSSARY

ALLUVIAL PLAIN
A level landscape unit with extremely low relief. There may be frequently active erosion and aggradation by channelled and overbank stream flow, or the landforms may be relict to these processes (Speight 1990:48).

ALLUVIUM
General term for detrital deposits made by rivers or streams (Lapidus 1987:18).

ARCHAEOLOGICAL SITE
A place containing cultural materials of sufficient quality and quantity to allow inferences about human behaviour at that location (Plog *et al* 1978:383).

ARTEFACT
Any object having attributes as a consequence of human activity (Dunnell 1971).

ASSEMBLAGE
A set of artefacts found in association with each other and therefore assumed to belong to the one phase or one group of people (Champion 1980:11).

BIFACIAL FLAKING
Flaking which has been undertaken on two opposing faces of an artefact (McCarthy 1976).

BIPOLAR CORE
An artefact with either negative flake scars present on opposite ends, or with negative flake scars and crushing (point initiations) present on opposite ends (McCarthy 1976:102).

BROAD PLATFORM
A platform which, when viewed from above, obscures the body of the flake. Usually produced by detaching the flake by striking well behind the platform margin (Witter 1992:110).

CHALCEDONY
A cryptocrystalline variety of silica, having a compact fibrous structure and a waxy lustre. It may be translucent or semi-transparent and occurs in a variety of colours. Chalcedony is often found as a deposit, lining or filling cavities in rocks (Lapidus 1987:99).

CHERT
A dense, extremely hard, microcrystalline or cryptocrystalline siliceous sedimentary rock, consisting mainly of inter-locking quartz crystals, sub-microscopic and sometimes containing opal (amporphous silica). Chert occurs mainly as nodular or concretionary aggregations in limestone and dolomite, and less frequently as layered deposits (banded chert). It may be an organic deposit (radiolarian chert), an inorganic precipitate (the primary deposit of

colloidal silica), or as a siliceous replacement of pre-existing rocks. Flint is a variety of chert occurring as nodules in chalk and having a conchoidal fracture (Lapidus 1987:102).

CORE
A piece of stone that has been used as a source for flake production. Cores are thus generally characterised by negative flake scars (Morwood and L'Oste-Brown 1995:162).

CORTEX
The natural weathered surface of rock, not the result of human activity (McCarthy 1976:101).

DISTAL
The opposite end of an artefact to the platform end. The blade of an edge-ground axe or the working edge of other implements form the distal end (McCarthy 1976:101).

DORSAL
The face of a flake that was exposed on the core before removal of the flake (Phagan 1976:39).

FACETED PLATFORM
A platform carrying a series of small scars and/or crushing on its surface (Hiscock 1988:86).

FEATHER TERMINATION
Is identified on the distal end of a flake which terminates in a sharp edge with a minimal margin. Feather terminations are an indicator of good knapping control (Crabtree 1972:64).

FLAKE
A piece of stone detached from a larger mass by the application of force and having a feather, hinge or step termination and a bulb of percussion. A platform may be present if the proximal end is unbroken (Crabtree 1972:64).

FLAKE TOOL
A flake that has been sharpened through deliberate retouch or which exhibits other evidence (eg usewear) to indicate that it has been used as a tool (Witter 1992:35).

FLAKED PIECE
Chipped artefacts with negative flake scars which cannot be classified as a flake, core or retouched flake (Hiscock 1988:64).

FOCAL PLATFORM
A platform having a small area such that when viewed from above, most of the remaining body of the flake can be seen. Focal platforms are produced by striking close to the platform edge (Witter 1992:110).

FOOTSLOPE
A slope landform element not adjacent below a crest or flat but adjacent above a flat or depression (Speight 1990:11-34).

GREYWACKE
Sedimentary rock. A very hard, dark grey or greenish-grey, coarse-grained sandstone characterised by angular particles and rock fragments embedded in a clayey matrix (Lapidus 1987:265).

HILL
Part of a landsystem of high relief with gently inclined to precipitous slopes. Fixed, shallow erosional stream channels, close to very widely spaced, form a non-directional or convergent integrated tributary network (Speight 1990:51).

HILLCREST
A very gently inclined to steep crest, smoothly convex, eroded mainly by creep and sheet wash (Speight 1990:31).

HILLSLOPE
A gently inclined to precipitous slope, commonly simple and maximal, eroded by sheet wash, creep, or water-aided mass movement (Speight 1990:31).

HINGE TERMINATION
Is identified on the distal end of a flake that terminates in a blunted or rounded right angle break. Hinge terminations occur when inadequate percussive force is applied and are thus an indicator of poor knapping control (Hiscock 1986b:49).

INNER COASTAL BARRIER
A sand deposit located landward of the outer coastal barrier, usually separated from the outer barrier by a lagoon or creek system. Inner barrier sands are characterised by low widely spaced ridges indurated by humic material, which abut bedrock outcrop on their western margin. Inner barrier deposits are thought to be Pleistocene in age and may be eroded or overlain by fluvial, estuarine, paludal or lagoon sediments (Winward 1974:597).

JASPER
A compact, microcrystalline variety of quartz. Its colours are variable, including white, grey, red, brown and black (Lapidus 1987:308).

LANDFORM ELEMENT
A topographic feature 40 metres or more in maximum dimension which forms part of a larger unit, the landform pattern (Speight 1990:9).

LATERAL MARGINS
The sides of an artefact- between the proximal and distal ends (McCarthy 1976:101).

LENGTH
Maximum dimension of a core or flaked piece in any direction; maximum distance along the percussion axis of a flake from the platform to the distal margin (Witter 1986:2).

MEDIAL
The middle section of an artefact (Phagan 1976:39).

MULTI-PLATFORM CORE
A core with at least one negative scar running in a different direction to the remainder. Multi-directional scars indicate that the core has been rotated to get the most economical use of the raw material (Hiscock 1986a:49).

NEGATIVE FLAKE SCAR
Concave surface resulting from the removal of a flake (Phagan 1976:39).

NUCLEAR TOOL
A core which, rather than being specifically used to supply flakes to be used as tools, is itself the tool. A nuclear tool is thus a core-like tool that did not originate as a flake (Witter 1992:30).

PEBBLE TOOL
A flaked and/or edge-ground nuclear tool that preserves some of the original pebble cortex.

PLATFORM
The plane or surface against which force is applied in order to detach a flake from a core. The platform may be the natural surface of the stone, or cortex, it may be a surface produced by the prior removal of one or more flakes, or a surface produced by grinding or abrading (Phagan 1976:11).

PLATFORM PREPARATION
Accomplished when the knapper strikes or brushes the edge of the core platform and removes small flakes from the edge. This prevents the platform from shattering (Hiscock 1988:86).

PLEISTOCENE
The lower division of the Quaternary Period dating from two million to 10,000 years ago (Lapidus 1987:96,411).

QUARTZ
Crystalline silica rock having no cleavage but a conchoidal fracture (Lapidus 1987:429).

QUARTZITE
A metamorphic rock consisting mainly of quartz grains. Formed through the recrystallization of sandstone by thermal or regional metamorphism (Lapidus 1987:430).

RETOUCH
The alteration to the primary termination of a flake caused by deliberate secondary flaking in order to resharpen or modify the edge (Crabtree 1972:89).

SANDSTONE
A sedimentary rock composed of sand-sized grains, mainly of quartz, in a matrix of clay or silt, and bound together by a cement that may be carbonate (Lapidus 1987:449).

SILCRETE
A siliceous duricrust composed of sand and gravel cemented by opal, chert and quartz, formed by chemical weathering and water evaporation (Lapidus 1987:472).

SILTSTONE
A fine-grained sedimentary rock principally composed of silt-grade material. Intermediate between sandstone and shale, siltstone contains less clay than shale and lacks its fissility and fine laminations (Lapidus 1987:474).

SINGLE PLATFORM CORE
A single platform is indicated when all scars on a core or the dorsal surface of a flake run in the same direction. A single platform on a core signifies less efficient use of the raw material than a rotated core with multiple platforms (Hiscock 1986b:49).

STEP TERMINATION
Is identified on the distal end of a flake which terminates abruptly in a right angle break. Step terminations occur when too much outward force is applied and are thus an indicator of poor knapping control (Hiscock 1986b:49).

STONE ARTEFACT
Fragment of stone that generally possesses one or more of the following characteristics:
- Positive or negative ring crack
- Distinct positive or negative bulb of force
- Definite eraillure scar in position beneath a platform
- Definite remnants of flake scars (i.e.dorsal scars and ridges)

These traits indicate the application of an external force to a core, and are characteristic of the spalls removed by humans using direct percussion. Stone artefacts which have none of the above may be identified as such if they possess ground facet/s characteristic of human industry (Hiscock 1984:128).

THICKNESS
The greatest dimension perpendicular to both the length and width of an artefact (Witter 1986:2).

UNIFACIAL FLAKING
Flaking undertaken on one face of an artefact only (McCarthy 1976).

VOLCANIC ROCK
Very fine-grained or glassy igneous rock produced by volcanic action at or near the earth's surface, either extruded as lava or expelled explosively (Lapidus 1987:535).

WIDTH
The maximum distance between the lateral margins of an artefact, measured at right angles to the length (Witter 1986:2).

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APPENDIX A

Fieldwork reports from the Birpai and Bunyah Local Aboriginal Land Councils

BUNYAH LOCAL ABORIGINAL LAND COUNCIL

SITE SURVEY REPORT

Date of Survey: 14th June 2006

Location: Proposed development– Rainbow Beach, Bonny Hills

Reason for Survey: The survey was carried, out at the request of Jackie Collins, Archaeologist to determine if the land affected by the above proposal contained any Aboriginal artifacts or sites of significance.

Survey carried out by: Trevor Roberts and Stan Chatfield

Results of survey: Eleven (11) artifacts were located on the proposed development site.

Report: The proposed subdivision is located within an area of very high cultural significance to the local Aboriginal people.

The area surveyed has been substantially cleared although there was a heavy covering of grass. The large number of artifacts located despite the heavy cover indicates that more will be located during the development.

Recommendation: All of the artifacts located have been moved to a safe location in the same area. The Bunyah Local Aboriginal Land Council has no objections to the proposed develop proceeding

Should any other artifacts or other indications of sites of significance be exposed, during the develop work, work should be halted and this Land Council and the NPWS notified immediately.

Trevor Roberts

Trevor Roberts: Sites Officer

Bulkara Enterprises

P.O.Box 433
Wauchope NSW 2446
Phones 6587 7170 65861241

ABN 99 485 987 272

10th July 2006

Archaeological Survey

An archaeological survey was undertaken at the Rainbow beach estate site.

In consultation with Archaeologist Mrs J. Collins it was agreed that six to seven test pits be carried out, this was decided due to the sensitivity of the site and the high probability that evidence of occupation will be confirmed.

The test pits are to be implemented before any archaeological clearance can be given.

Yours in unity

Lindsay James Moran
Senior Sites/Cultural Officer
BLALC/Mingaletta Development Corparation.

JACQUELINE COLLINS - *Consultant Archaeologist*

Adise Pty Ltd

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29th May 2008

Michelle Hollis
Luke and Company NSW Pty Ltd
PO Box 669
PORT MACQUARIE NSW 2444

Dear Michelle,

RE: PROPOSED CONSTRUCTED WETLAND AT RAINBOW BEACH, BONNY HILLS- ABORIGINAL SITE 4 (DECC REGISTERED SITE #30-6-0109)

As you are aware, I conducted a field inspection of Aboriginal 'Site 4' (#30-6-0109), located on Part Lot 123 DP 1106943, Rainbow Beach, Bonny Hills, with the assistance of Lindsay Moran (Birpai knowledge holder/ site custodian and senior cultural heritage officer with the Birpai Local Aboriginal Land Council) on the 20th of March 2008. Developer representatives Phil Luke (of Luke and Company NSW Pty Ltd) and James Dunn were also present to enable the required 'Site 4' protection limits to be accurately identified and mapped.

In liaison with Lindsay Moran, I wish to confirm that the proposed eastern boundary of the Constructed Wetland as delineated on 'Aboriginal Archaeological Site 4 Detail- Plan P15, Revision B, 22.4.08' provides a suitable boundary to the Constructed Wetland such that the Aboriginal cultural/social and scientific/ archaeological significance of 'Site 4' will be conserved.

With respect to 'Site 4' itself, it is recommended that the following measures be implemented to ensure the long-term preservation of its Aboriginal cultural heritage and archaeological values in the development-related context:

1) Geofabric matting should be placed across the previously excavated eastern parts of the site (adjacent to the existing gravel road) as necessary to maintain separation of the natural ground surface from fill areas (see Point 2 below) to facilitate site identification in the event of future archaeological investigation.

2) Fill material from the nearby Constructed Wetland should be used to re-instate the previously excavated eastern parts of the site (adjacent to the existing gravel road). As outlined in Point 1 above, all introduced fill material should be placed on Geofabric matting such that this fill material can be readily identified in the event of future archaeological investigation.

3) Works to be carried out with respect to Points 1 and 2 above should be supervised by an appropriately qualified person. Given his status as a local Aboriginal knowledge holder/site custodian and senior cultural heritage officer with the Birpai Local Aboriginal Land Council, I consider Lindsay Moran to be the most appropriate and qualified person for this task.

Please contact me should you or the Department of Planning require further information or advice.

Yours Sincerely,

Jacqueline Collins
Consultant Archaeologist (BA, Dip Ed, M. Litt, MAACAI)