

Roads and Traffic Authority

Pacific Highway Upgrade -
Oxley Highway to Kempsey
Aboriginal Heritage Working Paper

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Appendix B

Previous archaeological research

A predictive study for the Proposal was completed in consultation with the Aboriginal community (Kuskie 2005a, 2005b). It related to a broad corridor (approximately two kilometres wide). The preliminary study involved research into the archaeological, cultural and environmental context of the locality, searches of relevant heritage registers and planning instruments, consultation with the Aboriginal community and evaluation of four route options with respect to the potential impacts of each option on Aboriginal heritage. Further assessment and briefings were provided for a refined orange option, a Hastings River to Wilson River 'community option', and for Dalhenty Island.

Four areas of cultural sensitivity were initially identified within the two kilometre wide study area through consultation with the Aboriginal community (Kuskie 2005b). Further investigation, including field inspection, led to the conclusion that there is no evidence for a ceremonial site on Cooperabung Hill. Kuskie (2005a) concluded that in order to identify the nature and extent of any Aboriginal heritage evidence within the study area, its significance, the potential impacts of the Proposal on this evidence and to recommend appropriate management strategies, further investigation was required of the Proposal (reported herein).

Other relevant investigations include Happ and Bowdler's (1983) study of a 50 metre wide corridor along the 45 kilometre length route of a proposed 132 kV electricity transmission line between Port Macquarie and Kempsey, adjacent to the Pacific Highway. This route primarily traverses to the east or west of the present study area, crossing it near Kundabung. The power line route also traverses close-by to the east of the Proposal at the Wilson River sub-surface investigation location. Approximately 42 per cent of the route was inspected on foot, with vehicle reconnaissance employed to target specific areas for field survey. No new Aboriginal heritage evidence was located during this survey. Happ and Bowdler (1983) considered the riverine floodplains to be of low archaeological sensitivity, away from the major watercourses.

Telstra (formerly Telecom) installed a fibre optic cable between Newcastle and Brisbane in the early 1990s, of which the archaeological investigations were conducted by Davies (1991a, 1991b and 1991c, amongst others). Portions of the Telstra route lie within the present study area, including between Swamp Road and Blackmans Point Road, along the floodplain south of the Wilson River, and between Smiths Creek and Smiths Road around Kundabung. Approximately 95 per cent of the Telstra route recommended for survey in the preliminary assessment (Davies 1991b) was inspected on foot or from a slow-moving vehicle at close range (Davies 1991a:21). Twenty-four water crossings were inspected and sub-surface excavation was attempted at several. However, compactness of the ground prevented this from being successfully completed (Davies 1991c). Surface visibility and ground disturbance were noted as the major constraints to the assessment. Visibility of less than 10% was characteristic of over 60 per cent of the study area (Davies 1991a:20). No archaeological sites were located during the surveys of the route and water crossings in the vicinity of the study area, although realignments of the route were recommended to avoid known sites (Davies 1991a, 1991c).

Davies (1991b:19-20) constructed a predictive model of site location, based largely on the research and models of Byrne (1983, 1984, 1986) and Egloff and Oxley (1989a, 1989b). Briefly, it was proposed that in the rivers and floodplains, sites are most likely to occur on elevated ground or immediately adjacent to watercourses. In low hilly to undulating terrain sites are likely to occur on level ground along ridges (ridge crests, saddles and spurs) (Davies 1991b:20). In the coastal zone, middens are likely to occur on fore-dunes and parts of the hind dunes adjacent to wetlands and estuaries and on elevated ground adjacent to watercourses or wetlands in the coastal floodplain (Davies 1991b:20).

Kuskie (1992a, 1992b, 1993) undertook an assessment of the route of Optus Communications' fibre optic cable between Beresfield, near Maitland, and Coffs Harbour. This route lies to the east of the present study area, between the Oxley Highway and Hastings River, while the remainder of the alignment follows a more easterly coastal route. While no sites were located along the route in the vicinity of the present study area, Kuskie recommended a number of realignments of the proposed route in order to avoid known archaeological sites.

Collins (1995) surveyed portions of the southern-most five kilometres of the present study area as part of an environmental study of 'Area 13 (Thrumster)'. Area 13 comprised 4,200 hectares of land bordered to the north by the Hastings River, east by Port Macquarie Airport, south-east by Lake Innes Nature Reserve, south by Karikeree Creek, west by Cowarra State Forest and north-west by Haydons Creek. The investigation was undertaken to assess the potential for re-zoning of part of this area for urban development.

Four people investigated the area over a period of ten days using a 'stratified random sample' involving five per cent of the 4,200 hectare study area. Collins (1995) considered that approximately 34 per cent of the area was either un-surveyable or had been extensively developed and was not investigated. The remaining 2,775 hectare area was separated into six sample units, with eight 500 x 500 metre units also randomly selected for survey investigation. Approximately 41.5 hectares was surveyed, or one per cent of the total investigation area. Two of the areas surveyed encompassed small portions of the study area, north and south of Sancrox Road. A total of 51 heritage sites were identified during the investigation, comprising 17 isolated artefacts, 30 artefact scatters, one small shell midden and three scarred trees (Collins 1995). A number of these sites occur within a kilometre east or west of the Proposal, south of the Hastings River, but none are located directly within the present study area.

The sites 'Bocal 1' and 'Bocal 2' (DECCW #30-3-194 and #30-3-195), several hundred metres west of the Proposal, while assessed as being of low scientific significance, were considered to form part of a ceremonial area and therefore of high cultural significance. Collins (1995) reported that Aboriginal informants had been advised of the site by elderly non-Aboriginal residents who described hearing music and chanting and seeing many large campfires. This area is immediately northwest of the Pacific Highway and Sancrox Road junction, possibly on a hill crest now occupied by a hard rock quarry around AMG grid reference 482600:6521750. Collins (1995) assessed a scarred tree site close to the study area as being of medium to high archaeological significance, given the rarity of this type of heritage site in the area. The remaining isolated artefacts and artefacts scatters were assessed as being of medium to low or low archaeological significance.

Collins (1995) made a number of predictive statements regarding site locations for the study area, based on the findings of the sample. Collins (1995) suggested that there may be as many as 40 further artefact locations within the 'Area 13' study area and that these may be spread over the entire area. Further predictive statements included that:

- Sites based on Fault Zone Complex and Touchwood Formation rocks would occur in higher frequencies than on other geological formations.
- Open campsites and artefacts were more likely to be on flatter inclinations (<10 degree gradient) with the majority on level to very gently sloping ground.
- These sites would be concentrated on alluvial surfaces along water source margins (<350 metres) as well as on footslopes and spur crests.
- Most sites would be either under 10 metres AHD or over 20 metres AHD with a dominant aspect between 316 degrees – 45 degrees (north-north-west to north-east).
- Larger and more complex sites would be associated with water sources such as swamps (as opposed to lower order creeks and gullies) and low-gradient topography.

Collins (1995) recommended that in the case of any urban development, the areas of lower significance be collected while those areas of higher archaeological and cultural significance and potential sensitivity (such as identified sites and creek lines) be protected through enclosure within buffer zones.

Collins (in prep, quoted in 2003b) recently re-investigated a 780 hectare portion of 'Area 13'. Four isolated artefacts and three small artefact scatters were identified on basal slopes and valley flats adjacent to swamps and streams, although none within the present study area. Two large artefact scatters were also located on the basal ends of low spurs extending into swamps.

Collins and Sullivan (1993a) surveyed an area extending from the southern end of the present study area, as part of a proposed realignment of the Oxley Highway between Fernhill Road in Port Macquarie and the Pacific Highway. The survey targeted the second stage of the proposed realignment, which included the area between Wrights Road and the Pacific Highway. Of the six kilometre long study area, approximately 2.5 kilometres comprised open depressions (swampland) in the east, with the remainder comprising lower, mid and upper hillslopes and two ridge crests in the west. Collins and Sullivan (1993a) proposed that during wetter periods the lower lying areas would have been unsuitable for camping and that the higher ground may have been utilised. Food, potable water and stone materials (such as 'mudstone', quartz and chert) were noted as being readily available within this area.

Collins and Sullivan (1993a) surveyed the area on foot in two elongated transects, with variable effective survey coverage relating to ground disturbance and surface visibility. Two isolated artefacts were identified, comprising a 'mudstone' core in a gully above a creek (DECCW #30-3-156) and a quartzite flake on a ridge crest (#30-3-0157), along with a scatter of three artefacts on the lower slope of a ridgeline (#30-3-0158). Collins and Sullivan (1993a) assessed the areas containing the isolated finds as having low scientific significance, but being of general heritage value to the Birpai LALC. Aboriginal community monitoring during vegetation and topsoil clearance was recommended, with no further work required if this monitoring did not reveal any further Aboriginal heritage material.

Further investigations of this section of the Oxley Highway upgrade were undertaken by Collins (2003a, 2003b). Collins (2003a) aimed to assess potential options for the upgrade route deviation or duplication in order to reduce potential impacts to heritage resources. Collins (2003a) initially surveyed three corridors (the existing corridor, a potential deviation corridor and an option to the north) using systematic transects traversing each route, in addition to opportunistic sampling of many of the tracks and exposures in the vicinity. The existing corridor comprised low hills, slopes, ridges and watercourses. The majority of this area had been affected by land clearing for grazing, residential purposes and road construction. The deviation and northern corridors comprised low-lying floodplains in the east, extending to densely forested crests on ridgelines in the centre portions and finally to a narrow ridgeline and hillslopes in the western portion near the Pacific Highway interchange (Collins 2003a).

Collins (2003a) identified five previously unrecorded sites during the survey. Of these, three artefact scatters were identified in the deviation corridor and two isolated finds in the existing road corridor. No sites were identified in the northern option. Each of the newly recorded sites was identified on relatively low gradient footslopes (two to five degrees) with no apparent dominant trend in site aspect. Artefacts recorded included jasper and siltstone flakes and retouched flakes, siltstone and chert cores, a greywacke ground-edge hatchet head and a siltstone 'pebble tool'.

As an extension of the 2003 investigation, Collins (2003b) re-surveyed portions of the proposed corridor of impact for the Oxley Highway upgrade in order to more comprehensively assess the area. One further site was identified during the course of this survey, a sparse stone artefact scatter (five artefacts over 60 metres squared) on a broad, level hill crest, several kilometres from the present study area. The artefacts comprised siltstone flakes and siltstone and chert cores. Collins (2003b) suggested that based on the findings of the two surveys, as well as previous work in the area (such as Collins and Sullivan 1993a), the extent of ground disturbance rendered the scientific value of the sites low and limited the potential for evidence of significance.

Several years earlier, Hardy (2001) investigated a 1.2 kilometre section of the Oxley Highway, east of Thrumster Street and about 1.5 kilometres east of the present study area, for a proposed upgrade and widening. Hardy's (2001) survey area overlaps with that of Collins and Sullivan (1993a) and Collins (2003a), with common topographic units identified. Hardy (2001:3) follows Collins (1995) predictive model and suggests that areas of higher archaeological potential would include:

- Level ridges and foot-slopes near freshwater sources, which may contain artefact scatters.
- Transit-ways / paths are likely to have been along major ridgelines and crests, which are likely to contain smaller sites.
- Areas situated near suitable stone sources are likely to contain stone working / reduction sites.
- Mature trees may survive in the area and may have been modified (scarred trees).
- Isolated stone artefacts have the potential to occur across the entire landscape.
- Sites would almost never occur on slopes greater than 20 degrees and were unlikely to occur on slopes with gradients between 10 degrees and 20 degrees.

Appleton (1996) surveyed a 26 hectare area for a proposed extension to a hard rock quarry, located directly north of Sancrox Road and west of the Pacific Highway, immediately west of the present study area. Prior to the commencement of previous quarrying operations, the landform comprised a ridge crest. As much of the overburden had been removed prior to the survey, Appleton (1996) employed an opportunistic sampling strategy, which involved transects of two people walking over areas of identified exposures. During the course of this survey, Appleton (1996:24) recorded a single piece of flaked siltstone, but is uncertain as to whether it is an Aboriginal artefact or originated from blasting at the nearby quarry. Appleton (1996:24) noted that the stone was lying on top of leaf litter. The item, which occurs around AMG grid reference 482790:6521690, was not listed on the DECCW AHIMS register. Appleton (1996) suggested that further sites may occur in the area along the ridgelines and creeks radiating from the quarry hill.

Collins (1995:81) had suggested that the Bocal area (in the vicinity of the Sancrox Road quarry) contained a culturally significant place (refer above). Both Appleton (1996) and Collins (1995) had been advised by an informant, Mrs Betty Kramer, that ceremonies in the area lasted for about a week and that they were attended by several different tribes and took place at the same time each year. Appleton (1996) concurred that the quarry may well have been the location of a ceremonial site, however quarrying operations have since removed the original surface and any physical evidence of the site. Nevertheless, Appleton (1996) assessed the hill crest as a place of high cultural significance.

Appleton (1998b) surveyed a 12 hectare area opposite Telegraph Point, on the southern side of the Wilson River, for a proposed waterway recreation area. This area is located within one kilometre to the west of the present study area. The proposal involved the construction of two water ski lanes on the southern bank of the Wilson River. The area comprised a relatively level floodplain and swampland, which had been cleared and ploughed. The single day survey was conducted by two people employing an opportunistic sampling strategy, with only clear surface exposures inspected. No heritage sites were identified during the course of this survey. Appleton (1998b) suggested that while the area may have been used as an access point between the river and higher terrain, the absence of material was largely due to the deposition of sediments from the river and adjacent slopes and the generally waterlogged and insect-infected nature of the locality.

A number of other archaeological surveys and investigations have been undertaken within the Port Macquarie – Kempsey region. The results of investigations relevant to the present study are discussed below.

Several surveys have been undertaken east of the present study area around Port Macquarie. Bonhomme (1986) surveyed an area for a proposed bridge over the Hastings River at Settlement Point, approximately eight kilometres east of the present study area. No Aboriginal sites were identified during the course of the survey.

Collins (1996a) surveyed a one hectare area for a proposed extension to a silicified mudstone quarry, located immediately east of North Shore and the bridge investigated by Bonhomme (1986). The quarry site lies adjacent to North Shore Beach and comprises a small hillock edged by Holocene beach and marine dune sands in the east and south, along with swamp mud to the north and fluvial mud to the west. No Aboriginal heritage evidence was identified during the course of the survey.

Byrne (1990) conducted a survey for a proposed augmentation of the Port Macquarie water supply, with similar results. Byrne's (1990) study area included several dam sites south of the Oxley Highway – Pacific Highway intersection and pipeline routes extending from Lake Cathie north along the Pacific Highway to this intersection, and east to Port Macquarie and west to Wauchope.

Dean-Jones (1988) reported on a survey for the ring road to the south of Port Macquarie. It is located approximately five kilometres southeast of the present study area. No Aboriginal heritage evidence was identified along the route.

Collins and Sullivan (1993b) surveyed a 1.8 kilometre corridor as part of a proposed re-alignment of the Oxley Highway between Fernhill Road, Port Macquarie, and the Pacific Highway. The survey involved the first stage of the realignment proposal, which included the area between Fernhill Road and Wrights Road, within Port Macquarie township. The area lies approximately five kilometres to the east of the southern end of the present study area. The area is relatively gently inclined (<10 degree gradient), comprising mid portions of hillslopes in the east and a ridge / hill complex in the west elevated at between 10 and 20 metres AHD. The area was extensively surveyed on foot, however no Aboriginal heritage evidence was identified.

The single day survey was conducted in elongated transects over the entire study area, without representation from the local Aboriginal community. With the exception of a scarred tree adjacent to the road, which was identified as potentially being of Aboriginal origin, no other sites were identified during the course of the survey. From examination of a photograph presented in the Hardy (2001) report it can be concluded on a preliminary basis that the scar probably did not originate from Aboriginal activity.

Collins (1996b) surveyed a 12 hectare area for a proposed manufactured home estate, located approximately seven kilometres east of the southern end of the present study area, on the southern side of Port Macquarie. The area is situated on the western edge of undulating coastal hills, with a low spur and small watercourses draining to the south and north. It lies less than 10 metres AHD and borders Kooloonbung Creek. The single day survey comprised two people and involved both a systematic and a targeted sampling strategy, in which where-ever surface exposures were deemed adequate a series of transects were inspected (surveyors five metres apart). However, where surface visibility was generally lower, an opportunistic strategy was employed in which obvious exposures were inspected.

One isolated artefact and two artefact scatters were identified during the course of this survey, all of which were located on or adjacent to a spur-knoll (Collins 1996b). A majority of the 56 artefacts comprised fine-grained siltstone (64 per cent), with lower numbers (five or less) of other materials such as fine-grained volcanics, quartz, jasper, chert, tuff and greywacke. Artefacts were predominantly flakes and flaked pieces, although other types included bipolar cores and single and multi-platform cores. A relatively high proportion (48 per cent) of artefacts retained some cortex. Collins (1996b) suggests that while the siltstone and chert may have been sourced on-site, the other materials had been imported from elsewhere, although the high incidence of cortex is suggestive that most stone materials were procured from a relatively local area.

Two kilometres further south, Collins (2000) surveyed a 7.4 hectare area for a proposed retirement village. The area is situated on the relatively flat coastal plain adjacent to Innes Swamp within the Lake Innes Nature Reserve. The maximum elevation is only 3.4 metres AHD. Collins (2000) conducted a systematic survey of the entire area, with transects of three people spaced five metres apart. Two low-density shell middens, comprising pipi (*Donax deltoides*), were identified during the survey.

Collins (1996c) surveyed a five hectare area for a proposed extension to Newton's soil quarry. It is also situated adjacent to Lake Innes Nature Reserve on the southern side of Port Macquarie. The quarry area is located on drained and flood-prone flats 400 metres east of Kooloonbung Creek, a minor tributary of the Hastings River. The single day survey involved two people and focused on the more elevated terrain, as the lower lying areas comprised either water storage ponds or drained swamps. No Aboriginal sites were identified within the soil quarry area during the course of the survey, although an isolated find (a greywacke implement) was located just outside the southern boundary of the study area. In general, Collins (1996c) assessed the area as being of very low potential for further Aboriginal heritage evidence.

Collins (1996d) surveyed a 6.4 hectare area for the proposed 'Binnacle' residential subdivision, located on the western side of Port Macquarie approximately six kilometres east of the southern end of the present study area. The area comprised hill-slopes between 12 and 20 metres AHD, with gradients of up to 10 degrees. No Aboriginal sites were identified within the proposed subdivision area during the course of the survey. Collins (1996d) assessed the area as being of very low potential for further Aboriginal heritage evidence.

Collins and Sullivan (1996) and Collins (1997a) reported on the salvage and monitoring of an Aboriginal burial site and artefact scatters (DECCW #30-3-213 and #30-3-214) in Port Macquarie, approximately eight kilometres east of the present study area. The salvages were conducted as a response to the unearthing of human remains during the excavation of trenches for the Town Centre works (Stage 1). Two Aboriginal skeletons, along with the remains of two other individuals, were uncovered during the excavations. Numerous other finds were uncovered, including quantities of shell, bone, artefacts and charcoal.

A total of 492 stone artefacts were recovered from Stage 1 (Collins and Sullivan 1996) with a further 169 and 134 artefacts recovered from the salvage and monitoring of Stage 1B (Collins 1997a). Siltstone, greywacke, quartz and chert were virtually co-dominant at site #30-3-213, while quartz was dominant (c. 45 per cent) at site #30-3-214, with lower frequencies of 'mudstone', quartzite, and volcanics at both sites. A total of ten 'tools' (1.5 per cent of the combined assemblage) and 24 cores (3.6 per cent of the combined assemblage) were identified in the excavations. Approximately 18.6 per cent of the combined assemblage comprised flaked pieces. As to be expected, the monitoring yielded different results to the excavations, with a greater proportion of larger artefacts. The dominant shell species varied between the two sites, although was in both cases estuarine species such as mud whelk and oyster. Other shell types included cockle, cartrut and pipi. Macropod and fish bones were also recovered. Radiocarbon dates revealed that the cultural materials at site #30-3-213 had been deposited over a period of at least 1,410 years calBP (calibrated BP) (*Beta 91802*) and possibly slightly earlier (Collins 1997a).

Collins (1997b) surveyed a 37.5 hectare area for a proposed extension to Port Macquarie Golf Course, approximately nine kilometres south-east of the southern end of the present study area. The area comprised dunes and flats associated with the coastal margin and rose to a little over 10 metres AHD. The two-day survey undertaken by two people involved a combination of systematic elongated transects, along with opportunistic sampling of other exposures. Seven Aboriginal sites were identified during the course of this survey, comprising both stone artefact scatters and shell middens (dominated by pipis). The assemblages were generally dominated by chert, 'mudstone' and siltstone, with lower proportions of sandstone, jasper, greywacke, argillite, basalt, quartz and quartzite. Notable stone material resources were identified within the locality, including a banded chert source some two kilometres distant.

Bell (1983) surveyed an approximately ten hectare area at Dunbogan, approximately 20 kilometres south of the present study area. While middens, open campsites and scarred trees were known to exist in the area, no Aboriginal heritage sites were identified during the course of this survey. Rich (1992) performed sub-surface investigations on a sand dune (DECCW site #30-6-45) in an area adjacent to Bell's (1983) survey. Seventeen test units were excavated to yield extensive shell material, dominated by pipi, with lower frequencies of other species such as whelk, mussel, cockle and triton/cartrut. A number of flaked stone artefacts were also recovered.

The Herons Creek Duplication of the Pacific Highway has recently been completed several kilometres to the south of the southern end of the present study area. The Herons Creek deviation route was initially investigated by Comber (1990). A three day survey involving two archaeologists and a Bunyah LALC representative resulted in the inspection of all visible ground surfaces along the length of the route. No heritage evidence was identified, a result partially attributed to the narrow nature of the corridor and recent ground disturbance.

Further survey investigations of the Herons Creek Duplication were conducted by Brayshaw (1996) and Brayshaw and Haglund (1996). Five sites were identified between Ryans Road and Innes Road, two of which were subsequently salvaged by Haglund (1997). The four person team conducted excavations and a collection over a three day period. Salvage at site RRID-1 comprised collection of the four visible artefacts. The salvage of site RRID-3 comprised the excavation of an 8.5 metres squared area in slightly disjointed one metre wide intersecting transects. The excavation squares varied in size from 1 x 1 metre to 1 x 0.5 metres and were dug using picks and trowels, with material dry-sieved through five millimetre mesh (Haglund 1997:8). The excavations employed variable spit depths ranging from three to 12 centimetres.

The initial salvage questions that were proposed included analysing clusters of artefacts to identify manufacturing / discard events as well as technological attributes and potential use-wear residues. The results of the salvage excavations precluded these questions being answered, as the entire assemblage was attributed to raw material 'extraction', with no other identifiable events. With the exception of two volcanic pebbles (an anvil and a 'chopper'), the RRID-3 assemblage comprised 40 quartz artefacts (total artefact weight of 1,346 grams) as well as numerous quartz fragments, which were not conclusively identified as artefacts (total probable non-artefact weight of 9,658 grams) (Haglund 1997).

A number of relevant investigations have been conducted west of the southern portion of the present study area, towards Wauchope.

Appleton (1997a) conducted a preliminary desktop analysis of a 1,700 hectare area, situated approximately five kilometres west of the southern portion of the present study area, for a proposed rural-residential development. Appleton's study area is located along Kings Creek, southeast of Wauchope. The area comprises a variety of terrain units, including the potentially resource-rich areas along Kings Creek and other drainage lines, along with hill slopes and a dominant ridgeline in the south of the area. Appleton (1997a:35-37) made a series of predictive statements regarding the potential heritage resources of the area:

- Isolated artefacts and artefact scatters may be present in erosion features along creek lines, stock trails, washouts, slumped creek banks, but no 'debitage' would be visible.
- Sites may also occur on spurs and ridgelines and assemblages on stony contexts might contain a variety of materials, as well as a variety of diagnostic 'types', but no 'debitage' would be visible.
- There would be no art sites, grinding grooves or surviving scarred trees.

- There would be no surface evidence for burials, however, burials may exist within the area.
- It is unlikely that any bora rings would have survived.
- It is unlikely that any stone arrangements would occur, but if they are present they would be situated on spurs and peaks of the higher elevated areas in the south.
- It is unlikely that any shell midden material would be visible, but if present it would occur along creek lines with permanent or semi-permanent water.
- There would be no intact occupation deposits unless there are caves/rock shelters in the area (if present they would occur on spurs and peaks of the higher elevated areas in the south).
- There are no known natural mythological sites in the area.
- Suitable stone materials may well be located at AHD 60 metres on any ridges or level high ground and may be associated with artefact scatters (quarrying of *in-situ* stone is not anticipated).

More specifically for the Kings Creek area, Appleton (1997a:36-37) suggested that:

- Archaeological material might occur across the entire area.
- Material in areas which had already been subdivided/developed was likely to be in a disturbed context and can be considered to have already been 'destroyed'.
- Material along creek flats and plains might be exposed in plough zones but will generally only be exposed during further earthworks/excavations.
- Material located in forested areas will only be readily identified in tracks, erosion features and during forest clearing.
- Most stone artefacts will be made from locally available materials sourced from the ridges and upper slopes to the south and east. These would include the metasedimentary stones of quartz, quartzite, jasper, chert, silcrete and 'mudstone', but might also include volcanics for hatchet manufacture.
- Artefacts found near stone material sources are likely to retain cortex with little to no retouch and artefacts more distant from sources would be more reduced and would display evidence of retouch.
- Larger more complex sites (more artefacts and greater variety) would occur on ridges and plateaux.
- Less rich sites with fewer artefacts would be located further away from source areas, except in maintenance areas or camp sites where diagnostic tools would be identifiable.

A number of areas were identified as potential candidates for moderate to high archaeological potential. These included:

- All continuous and semi-continuous ridgelines, particularly those trending north / south (as potential transit routes) and at AHD >80 metres as potential stone material sources.
- All north / south trending creek lines and connecting saddles which could be potential transit routes.
- All creek flats and plains with an elevation of less than ten metres above the creek, which have the potential to contain middens, burials and isolated artefacts.
- Elevated better drained areas for camp sites.

Appleton (1997a) also noted that a restricted area, either a burial and/or a women's site, had been previously recorded within the Kings Creek location.

Appleton (1997b) surveyed an 8.7 hectare area as part of a program to test the validity of earlier predictive statements (Appleton 1997a). While minimal survey data is presented, it appears that the survey was performed on an opportunistic basis with visible exposures examined, along with a greater emphasis along the creek lines. Even though Appleton (1997a) had classed the potentially resource rich zone along the creek as having a high archaeological potential, no heritage sites were identified during the course of the investigation. This absence was partially attributed to dense vegetation obscuring visibility, as well as previous impacts to the area from farming activities.

Appleton (1998a) undertook a further survey within the Kings Creek area and investigated nine lots proposed for rural-residential development. While several of the areas investigated included contexts predicted as having a high archaeological potential, only two isolated finds were identified during the course of the survey. A single silcrete artefact was located on the north-facing lower slopes above a floodplain and a 'cherty' flake was located on a spur crest.

After completion of the survey Appleton (1998a) suggested that the initial preliminary synthesis (Appleton 1997a) may have been somewhat optimistic in terms of how much heritage evidence may be located in the study area. Appleton (1998a) however suggests that while the quantity of evidence in the area may be substantially less than initially predicted, the general model of site locations and predictions of the degree of difference between assemblages and their contexts remains appropriate.

Appleton (2000) undertook a further survey within the Kings Creek area to investigate another nine lots proposed for rural-residential development. As with the earlier study (Appleton 1998a), while several of the areas investigated included locations predicted as having a high archaeological potential, only one site comprising two stone artefacts was identified during the course of the survey. These artefacts were located on the crest and rim of a ridgeline and comprised a single 'mudstone' flake portion and a quartz flake. After completion of the survey, Appleton (2000) maintained that the initial preliminary synthesis (Appleton 1997a) may have been somewhat optimistic in terms of how much heritage evidence may be located in the study area. Appleton (2000) suggests that this is primarily due to the kinds of exposures in the area, in conjunction with the degree to which farming practices have affected the area.

Collins (1998a) surveyed a two hectare area for a proposed limestone mine in Broken Bago State Forest, near Wauchope (approximately 13 kilometres west-south-west of the southern end of the present study area). The area comprised gentle slopes, ridges and crests between 62 and 45 metres AHD. Collins (1998a:20) employed a series of three-person transects of variable width "tailored to suit the type of exposure being traversed". One isolated find was identified during the course of the survey, an 'indurated siltstone' flake located on a level ridgeline in a disturbed context.

Further to the north, between the Hastings River and Wilson River, Collins (1998b) surveyed a 141 hectare area for the proposed Cairncross Waste Management Depot. It is situated one kilometre west of the present study area at the Pembroke Road and Reids Road junction in Cairncross State Forest. A 20 metre wide access road extends east to connect with the Pacific Highway within the present study area. The investigation area comprised ridgelines, spurs, hillslopes and drainage depressions at elevations between 20 and 51 metres AHD and gradients of up to 10 degrees. The two day survey involved two people employing an opportunistic sampling strategy along exposures such as vehicle tracks. Where larger exposures were identified, transects were used, with the surveyors walking these areas five metres apart (Collins 1998b).

Four Aboriginal sites were identified during the course of the survey, all of which were stone artefact occurrences (three artefact scatters and one isolated artefact). Eleven artefacts were recorded, including five of siltstone, three of chert, two of greywacke and one unidentified volcanic. One item comprised a fragment of an edge-ground hatchet. All of these sites were located on spur crests or ridgelines in association with reasonable surface exposures (Collins 1998b).

Collins (1998b) reports on the location of an Aboriginal Reserve (Cairncross No. 19474), which was gazetted in 1894, several kilometres west of the present study area and Pembroke Road and the North Coast Railway. Birpai Elder William Holten (Senior) informed Collins (1998b:10) that the reserve extended from the south bank of the Wilson River across Reids Road to Muddy Gully. An Aboriginal camp, comprising a number of bark huts, was occupied at Muddy Gully until the 1930s (Collins 1998b:10).

Collins (1998b:10) also reports on Birpai informants' (William Holten Snr and Lindsay Moran) knowledge of post-contact Aboriginal camp sites at the confluence of Tommy Owens and Rawdon Creeks (in Rawdon Creek Nature Reserve, between the Hastings and Wilson Rivers, about 1.5 kilometres west of the present study area) and slightly further south at the confluence of Rawdon Creek and the Hastings River. The latter locality is known as Freemans Bay or Hughes Inlet and is within 1.5 kilometres of the Proposal.

Further north near Telegraph Point, Dean-Jones (1989) surveyed a small (20 x 20 metre) area for a microwave repeater station. This location, at Red Hill, is situated approximately four kilometres west of the present study area. No heritage evidence was identified.

Immediately north of the present study area, assessments have been undertaken of route options for the Kempsey to Eungai upgrade of the Pacific Highway. A total of 41 Aboriginal heritage sites were identified in the survey of the two primary route options, including 16 artefact scatters and 13 isolated artefacts (Parsons Brinckerhoff 2004).

Navin Officer (2007) undertook more detailed assessments of the Kempsey to Eungai Proposal. The route, of approximately 40 kilometres length, extends from the Maria River northward and to the east of Kempsey, across the Macleay River immediately east of Frederickton, and further north to Eungai. The area largely comprises the low-lying valley floor of the Macleay River, along with fringing coastal hills. A corridor of generally 100 metres width was investigated, in a survey over four days in February 2005 involving representatives of the Kempsey LALC and Dunghutti Elders.

Navin Officer (2007) identified one site, a small artefact scatter, during the survey. In addition, four artefact scatters and a "possible" scarred tree had previously been recorded along or within the vicinity of the Kempsey to Eungai Proposal (cf. Parsons Brinckerhoff 2004). The artefact scatters were located on ridge and spur crests and on the basal slopes of spurs. In addition, Navin Officer (2007) identified 12 "Potential Archaeological Deposits" (PADs). An extensive program of sub-surface test excavation was recommended for these potential deposits, along with salvage collection of the identified surface artefacts within the impact area.

Collins (1993) surveyed a 65 hectare area for the proposed Fattorini Creek off-river water storage dam, 11 kilometres west of Kempsey and approximately 12.5 kilometres from the northern end of the present study area. The area comprised a small basin located at the foothills above the Macleay River. It varied from relatively gentle to steep (<10 degrees to 25 degrees) slopes elevated at between 30 and 70 metres AHD. No Aboriginal heritage evidence was identified during the course of the single day survey.

Navin Officer (2000) surveyed an 80 hectare area for a proposed correctional facility north of the Macleay River, west of Kempsey. It is located approximately nine kilometres north-west of the present study area. The area comprised low gradient spurs and undulating slopes and ranged from 11 to 40 metres AHD. The single day survey was conducted by three people employing an opportunistic sampling strategy targeting areas with better ground exposures. No Aboriginal sites were identified during the course of this survey. Navin Officer (2000) maintain that the lack of sites was due to two factors:

- Ground visibility was generally very low and surface exposures were often only along tracks and discrete areas.
- The types of terrain in the study area were generally not representative of archaeologically sensitive topographic units.

Mills (1997) conducted a preliminary survey of a 112 kilometre long corridor between Kempsey and Coffs Harbour for a proposed 132 kV electricity transmission line. The area commences approximately five kilometres north of the northern end of the present study area and extends further northwards, predominantly within an existing power easement. The survey of the 504 hectare area (112 kilometres by approximately 45 metres wide) was performed primarily from a vehicle over a five day period, with 20 metre wide transects examined. Sporadic inspections on foot were conducted, with total effective survey coverage reported to be 12.68 per cent of the entire area. Not surprisingly, given the nature of the survey methodology, only four sites were identified during the course of the survey. A further 38 areas were identified as being potentially archaeologically sensitive, including seven areas that were identified by the local Aboriginal communities as culturally sensitive. The reported sites were typically located on valley flats/floodplains and included three that were recorded as having 'no evidence present'.

A broader regional-scale study was conducted by Packard (1992), involving a preliminary assessment of Aboriginal heritage within the Kempsey and Wauchope State Forest Management Areas. The 315,000 hectare study area included several State Forests (Maria River, Kalateenee, Ballengarra and Cairncross), which extend to within the present study area. Minimal archaeological investigation had previously been conducted within these management areas. Packard (1992) aimed to gain an initial understanding of the archaeology of the region in order to develop and refine a predictive model of site location that could be used as the basis for planning and management of forestry activities. The 15 day survey predominantly employed a non-random opportunistic sampling strategy targeting exposures such as vehicle tracks and areas of erosion. Specific landform elements were targeted to ensure the variety of different environmental contexts in the large study area were sampled. Two survey transects (Maria River 1 and Maria River 2) were inspected adjacent to the northern end of the present study area.

Packard (1992) located 55 sites within the areas sampled in the State Forests, all of which were artefact scatters or isolated finds, apart from one rock shelter with deposit. Two sites were located in the Maria River survey areas (DECCW #30-3-152 and #30-3-153), east of the northern end of the present study area. The sites in the overall study area were found to be located within the entire range of altitude (0-1100 metre AHD) present. Packard (1992) identified that while ridges and lower slopes contained the greatest number of sites, it was also apparent that these environmental contexts were also subject to the most sampling. A similar situation applied in terms of gradient, whereby the most gently sloping terrain also contained the most sites, but was also more extensively sampled. The notion of site aspect also proved to be relatively consistent in terms of the occurrence of sites by area investigated, with only sites facing west being slightly less common (seven per hectare compared with 10 to 15 per hectare for all other aspects).

Interestingly, Packard's (1992) data suggests that those sites facing east and south were more likely to have higher artefact densities. Analysis of site location in relation to current vegetation patterns did not yield useful results, as although dry sclerophyll forest was the dominant type for site location, it also provided the greatest surface visibility.

Most importantly, Packard (1992) compared variations in artefact density per square metre of effective survey coverage for a range of environmental variables. This reduces the bias noted above caused by variations in the quantities of areas surveyed with different attributes. In relation to the environmental variables examined, Packard (1992) noted that:

- Artefact density was higher per square metre of effective survey coverage on upper slopes (0.0356), ridges (0.034), crests (0.0212) and saddles (0.0208) than other landform units (for example, 0.0103 on lower slopes, 0.007 on flats, 0.003 on mid-slopes, 0.0025 on spurs and 0.0023 on simple slopes).
- Artefact density was higher per square metre of effective survey coverage on level to very gently inclined slopes of 0-2 degrees (0.0413) than on gentle slopes of 2-5 degrees (0.0034) and more inclined gradients of 5-10 degrees (0.0014).
- Artefact density was higher per square metre of effective survey coverage in areas with a southerly (0.044) or easterly (0.0387) aspect, than in areas with an open aspect (0.0122), or northerly (0.0098) or westerly (0.0044) aspect.
- Artefact density was higher per square metre of effective survey coverage in areas of dry sclerophyll forest vegetation (0.0239) compared with areas of wet sclerophyll forest (0.01) or heath, swamp or riparian vegetation (0.0042).
- Artefact density was higher per square metre of effective survey coverage in areas of Permian sedimentary underlying geology (0.0258) than in areas of Carboniferous sedimentary (0.0127), Permian acid intrusives (0.0032) or Devonian metamorphics (0.0028).
- Artefact density was higher per square metre of effective survey coverage in areas at elevations between 200 and 300 metres above-sea-level (0.0848) and 400-500 metres above-sea-level (0.0441) than in other elevations.
- Artefact density was higher per square metre of effective survey coverage in the ranges land system (0.04) than in the coastal ranges (0.0217) or broad valleys (0.0213).

The NSW National Parks and Wildlife Service (NPWS, now part of the Department of Environment, Climate Change and Water) has prepared Plans of Management for three areas that are within close proximity of the Proposal. The Plan of Management for Rawdon Creek Nature Reserve (NPWS 2004a), immediately west of the Proposal between the Hastings River and Wilson River, identifies that although no recorded sites were known in the Nature Reserve at that time, neither had any heritage surveys been undertaken. The Plans for Kumbatine National Park and State Conservation Area (NPWS 2003) and Maria National Park (NPWS 2004b), near the northern end of the Proposal, identify the presence of artefact scatters, isolated artefacts, scarred trees and a lithic quarry (shallow holes dug into a ridge crest gravel scree) within these Parks.

Numerous Aboriginal sites in the wider region have also been recorded during research projects. Some of this evidence is summarised in the overview heritage study of the Kempsey Shire undertaken by Egloff and Oxley (1989a, 1989b). Ray Kelly, former Aboriginal Sites Officer of the NPWS, recorded a number of these sites, including many of high significance to the Aboriginal community (Kelly and Donovan 1976).

Campbell (1972) excavated shell middens in different topographical locations at McGuire's Crossing, Clybucca Creek and Connection Creek. The McGuire's Crossing site (#30-7-7), on the outer dune barrier along the coast east of the present study area, was dated to 1210±90 BP. Clybucca Creek midden no. 1 (#21-6-52) was dated to 3850±140 BP and site #30-3-37 on Connection Creek (also east of the present study area) was dated to 4850±160 BP (Campbell 1972:283-6).

Further research between 1972 and 1975 by Graham Connah and staff and students of the University of New England resulted in eight shell middens being excavated (Egloff and Oxley 1989a). Clybucca Creek midden #3 was dated to 5120±150 BP and Inner Barrier 4 (#30-7-2) near McGuire's Crossing was dated to 2550±105 BP (Egloff and Oxley 1989a).

The available evidence indicates that Aboriginal exploitation was focused on the abundant subsistence resources of the coastal and riverine zones over the past 6,000 years, around which time the sea had reached its current level. Fish and animal bones from numerous species, along with various shellfish, have been recovered from the excavated coastal sites. Stone artefacts recorded from these sites are made from various locally available materials, including greywacke, chert, volcanics and sandstone. A rich ceremonial life is evidenced by ethnohistorical observations and the existence of ceremonial grounds, stone arrangements, carved trees and natural / mythological / ritual sites.

The distribution of stone artefacts appears to be 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 surveys and salvage excavations throughout south-eastern Australia (for example, Hall 1991, 1992, Hall and Lomax 1993, Kuskie 2000, 2005c, Kuskie and Clarke 2004, 2006, Kuskie and Kamminga 2000, Packard 1991, 1992). A number of reports indicate utilisation of the hinterland hills and ranges may have been more extensive than previously recognised (for example, Packard 1992). Sites in these zones tend to be focused along the ridgelines and adjacent to watercourses. However, the distribution of artefact 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 and Mitchell 1993). As demonstrated by numerous studies, a substantial predicted or 'potential' resource typically exists, the nature and extent of which can only be resolved through sub-surface excavation.