



Proposed Residential Subdivision Lots 682 (DP 568678), 705 (DP 613881) and 810 (DP 247285) Manyana, NSW

Archaeological Subsurface Testing Program

June 2008



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A Report to Watkinson Apperley Pty Ltd
for JWA Pty Ltd

EXECUTIVE SUMMARY

- JWA Pty Ltd is proposing to develop a residential subdivision at Manyana on the NSW south coast.
- A cultural heritage assessment of the proposed subdivision footprint was undertaken in 2005. It was recommended that, prior to commencement of the development; further archaeological assessment including subsurface investigation should be undertaken in known sites and in the impact zone.
- Consequently a program of archaeological subsurface testing was conducted for the Manyana Subdivision area. An area of approximately 10 ha was subject to archaeological testing on a rough 40 m grid. Twenty seven test pits were dug out of 30 proposed test locations within the development footprint. All pits were excavated using a backhoe.
- A total of four hundred and seventy nine (479) lithic items were recovered from twenty one of the twenty seven test pits excavated within the proposed development area at Manyana.
- Three geological types were identified in the Manyana lithic assemblage, predominantly comprising of silcrete, quartz and basalt.
- A range of manufacturing activities are present at Manyana, and there is evidence for spatial variability in the representation of flaking, retouching and heating of artefacts.
- The assemblage is characterised as 'microlithic' in character and it is inferred that the assemblage accumulated at some time within the last 3,000 years.
- The site characteristics across the study area revealed by the test excavations are an open-air, variously low to moderate density subsurface cultural deposit of lithic artefacts.
- The site overall is assessed as low local scientific significance.
- Based on the archaeological assessments provided in this report, the deposits of low and moderate archaeological significance are not considered to pose a constraint to the proposed development of the Manyana Subdivision area.
- *It is recommended that:*

No further archaeological investigation is required within the proposed Manyana subdivision development area.

As the Manyana development is being conducted under Part 3A of the *Environmental Planning & Assessment Act (1979)*, this removes the need for single-issue approvals under the *National Parks and Wildlife Act (1974)* and the development may proceed without gaining an Aboriginal Heritage Impact Permit (s90 Consent to Destroy) from the Department of Environment and Climate Change.

One copy of this report should be provided to each of the registered Aboriginal stakeholder groups.

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1. INTRODUCTION

1.1 Background to the Subsurface Testing Program

This report documents the results of a program of Aboriginal archaeological subsurface testing conducted within a parcel of land located at the small village of Manyana, 10 km north of Ulladulla and one kilometre north of Cunjurong Point at the entrance of Conjola Lake on the south coast of NSW (Figure 1.1).

The area under consideration is a proposed subdivision of Lots 682 (DP 568678), 705 (DP 613881) and 810 (DP 247285) at Manyana. These three lots are residual lots from previous subdivision development of the area that has been progressively developed over the last 45 years.

The current proposal is for an infill development to complete the subdivision of the area. The subject area is approximately 10 hectares in size. The development includes construction of roads and other infrastructure and 57 residential lots and 1 public reserve (Figure 1.2). Lots south of Sunset Strip and east of the unnamed road back onto an Environmental Protection area (to be dedicated to Shoalhaven City Council). This area will not be developed and will be kept as open space. It will however have a cleared fire break around the back of the house lots and a detention basin.

Two Aboriginal sites (CS14 and CS25) and two areas of potential archaeological deposit (PAD 1 and PAD 4) were identified in the Manyana Subdivision area in the course of investigations associated with the Conjola Sewerage Scheme project (Navin Officer Heritage Consultants 2001a, b, c).

Five sites (MS1, MS2, MS3, MS4 and MS5) were identified during the course of a field survey of the Manyana Subdivision area conducted in 2005. These sites comprised of four artefact scatters and one isolated find (Navin Officer Heritage Consultants 2005a).

It was concluded that the potential impacts of the proposed development on the cultural heritage values of the study area could not be fully determined without conducting a program of subsurface archaeological testing to assess the nature and significance of the archaeological deposits.

It was recommended that a program of archaeological subsurface testing should be conducted within the subdivision zone to assess the impacts of the proposed development on the archaeological resource identified across the study area.

This report documents the results of the Manyana archaeological subsurface testing program. The study fulfils the requirements of the recommendations for subsurface testing within the Manyana Subdivision area. The report was commissioned by Watkinson Apperley Pty Ltd for JWA Pty Ltd.

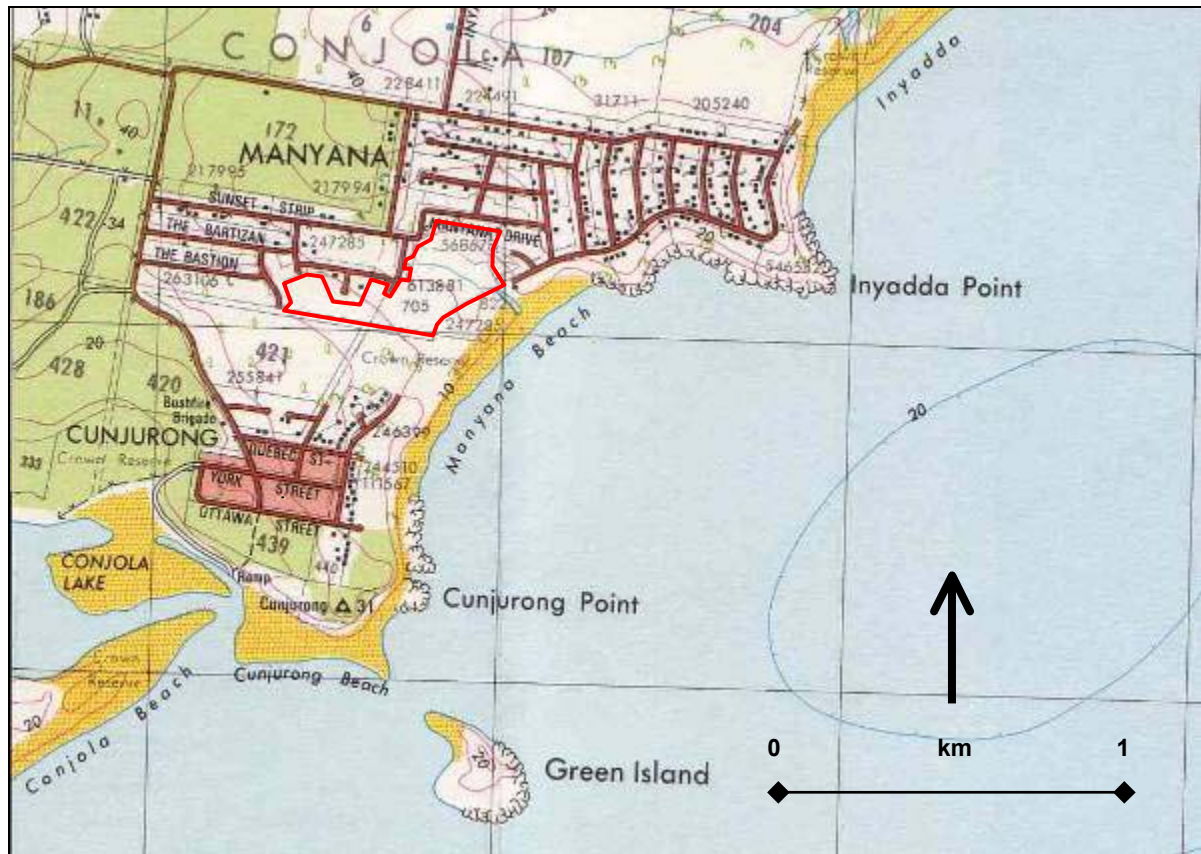
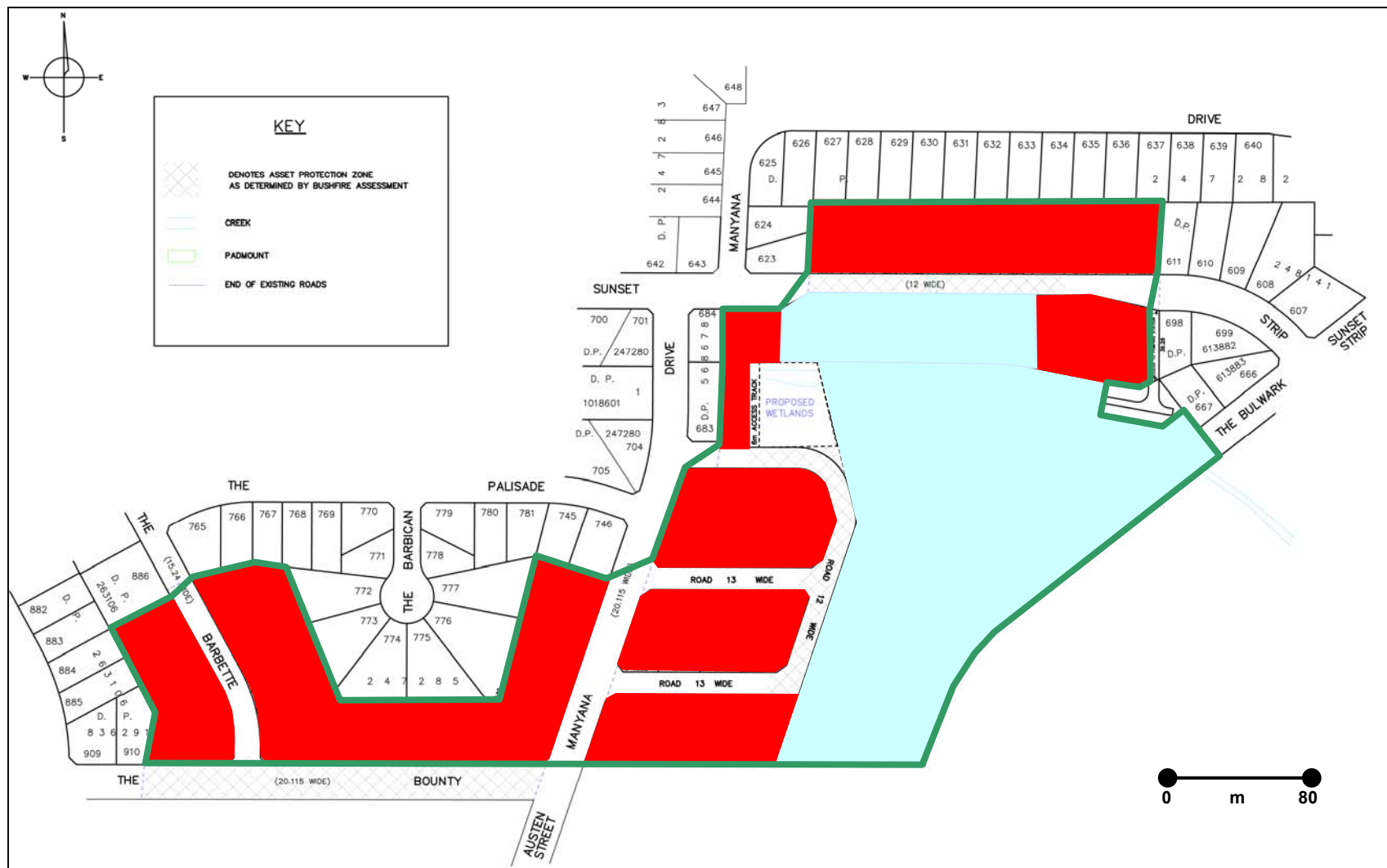


Figure 1.1 Location of the Manyana study area
(extract from Conjurong Point 1:25,000 topographic map 2nd edition)



Manyana Subdivision – Archaeological Subsurface Testing Program
Navin Officer Heritage Consultants June 2008



2. ABORIGINAL PARTICIPATION

The *Interim Guidelines for Aboriginal Community Consultation – Requirements for Applicants* prescribe DECC consultation requirements for the preparation of applications for approvals under Part 6 of the National Parks and Wildlife Act 1974 (NP&W Act). Although the Interim Guidelines do not have direct application to the preparation of this report, as approvals under Part 6 of the NP&W Act are not required because the project has been approved under Part 3A of the Environmental Planning & Assessment Act 1979 (EPA Act), the consultation requirements have been complied with in its preparation, having regard to Section 8.1 of the Amended Statement of Commitments in the Minister's Approval.

In accordance with the Interim Guidelines, letters were mailed on 27 August 2007 to the Jerrinja Local Aboriginal Land Council (JLALC); NSW DECC; NSW Department of Aboriginal Affairs, the NSW Native Title Office and Shoalhaven City Council.

Notices (see below) were placed in the *South Coast Register* (29/8/2007); and the *Milton Ulladulla Times* (29/8/2007) inviting Aboriginal parties to formally register their interest in taking part in the proposed archaeological works at Manyana by 14 September 2007.

ABORIGINAL HERITAGE ASSESSMENT

Navin Officer Heritage Consultants Pty Ltd has been commissioned by Watkinson Apperley Pty Ltd to undertake subsurface archaeological investigation of various Aboriginal sites and areas of predicted archaeological potential at the Manyana Subdivision Area).

The investigation is required to assess the potential impact of the proposed development of these lands on Aboriginal cultural heritage values. The investigation is being assessed under Part 3A of the *Environmental Planning & Assessment Act*.

The area subject to investigation consists of approximately 10 hectares situated to the south of Manyana Drive.

As required by the Department of Environment and Conservation's *Interim Guidelines for Aboriginal Community Consultation*, we are inviting registration from interested Aboriginal groups and individuals in relation to this assessment.

Please forward expressions of interest to:

The Secretary
Navin Officer Heritage Consultants Pty Ltd
4/71 Leichhardt Street
Kingston ACT 2604

The closing date for this registration of interest is 14th September, 2007.

The Jerrinja LALC responded to the notice and was formally endorsed as a Registered Stakeholder. Shoalhaven City Council also registered its interest.

The Manyana Subdivision Study Area falls within the boundaries of the Jerrinja LALC. The Land Council was in administration at the time the archaeological subsurface testing program was conducted.

A copy of the subsurface testing methodology was provided to the Jerrinja LALC (20 September 2007) for their review and comment. No comments were received and the methodology was subsequently endorsed on the 23 October 2007.



Field representatives were organised through the Administrator. William Connolly, Edward Stewart, Alfred Wellington and Noel Wellington represented the interests of the Jerrinja Local Aboriginal Land Council in the Manyana subsurface testing program (Figures 2.1 and 2.2).

A copy of this report will be forwarded to the Jerrinja LALC for their records.



Figure 2.1 Excavating at test pit 18



Figure 2.2 At the sieve station





3. ENVIRONMENTAL CONTEXT

3.1 Geomorphology and Geography

Geologically the underlying bedrock of the Manyana location consists of conglomerates, sandstones and silty sandstones of the Conjola Formation, a component of the Permian Shoalhaven Group.

Of relevance to this study is the presence of silcrete in the local area as this material has been exploited by both Aboriginal and European inhabitants in the past. Silcrete is a brittle, intensely indurated rock composed mainly of quartz clasts and cemented by a matrix which may be well-crystallised quartz, cryptocrystalline quartz clasts or amorphous (opaline) silica (Langford-Smith 1978:3). The texture of silcrete reflects that of the host rock and clasts may range in size from very fine grains to boulders. Silcrete is produced by an absolute accumulation of silica, which is made available by chemical weathering.

The silcrete on the coastal lowland is confined to a 'discontinuous belt of flat to undulating terrain extending 2 to 3 km from the sea' (Young 1978). Callender (1978:216) notes that the Milton district silcretes are typically grey and highly indurated with poorly-sorted angular clasts grading into a fine-grained authigenic quartz cement. The coastal silcretes are chemically and morphologically identical to silcretes found in the high plain west of the coast. Young (1978:195) describes them as 'thick, *in situ* chemically indurated cappings resting on thoroughly leached substrata' which appear to date to the early Tertiary. At Bendalong, siliceous solutions weathered from the intensely rotted basalt may have provided much of the matrix for the underlying silcrete (Young 1978).

The Manyana study area comprises of approximately 10 ha parcel of gently sloping ground on the eastern side of a broad, low gradient spurline that forms Cunjurong Point. The ground slopes in a northeasterly direction into a shallow drainage line leading east to Manyana Beach. The northern part of the study area comprises gently sloping ground at generally lower elevation that slopes into the drainage line that runs through the centre of the study area. This area also contains flatter, swampy ground. The soil profile at the eastern end of the study area is dominated by sands from adjacent coastal dunes. Elsewhere the profile consists of a deep loam, incorporating slopewash material from upper slopes, and overlying clays.

The vegetation within the study area is determined mainly by the elevation. The lower sections have more swampy type vegetation such as reeds, paperbarks and Casuarinas. The more elevated portions have a more open ground cover with ti-tree and Eucalypts such as Scribbly Gum and Stringybarks.

3.2 Landuse

European landuse has resulted in a variety of landuse impacts and widespread disturbance and modification to the ground surface. Major ground disturbance has occurred in the eastern portion of the study area and to the south, east and west of properties fronting onto The Palisade, The Barbican and Manyana Drive. Aerial photographs (Australian National Library aerial photograph-#96160 Ulladulla Run 1 March 1944, #4232 Ulladulla Run 4T May 1971) taken in 1944 and 1971 indicate that within this period there occurred extensive removal of native vegetation for the extraction of resources such as silcrete and clay soils.

Most, if not all of the local original surface outcrops of silcrete have been extensively quarried by Europeans. This activity, has at best, superimposed, and at worst removed or irretrievably scattered any original evidence of Aboriginal exploitation of these outcrops. What now remains are the European quarry locations, and in many cases, remnant cobbles and flaked debris which indicate where surface silcrete may have been available and collected by Aboriginal people. Figure 3.1 provides an aerial view of the Manyana Subdivision area, showing the heavily quarried portion along the southern boundary.



Other landuse impacts within the study area include:

- removal of native vegetation;
- the formation and construction of tracks for vehicles and bicycles;
- urban development from adjacent properties including landscaping;
- installation of above ground and underground services association with the current Manyana village including water and sewerage pipelines, transmission lines, and telecommunication cabling; and
- dumping of fill in low lying areas within swampy areas and along the sewerage easement.

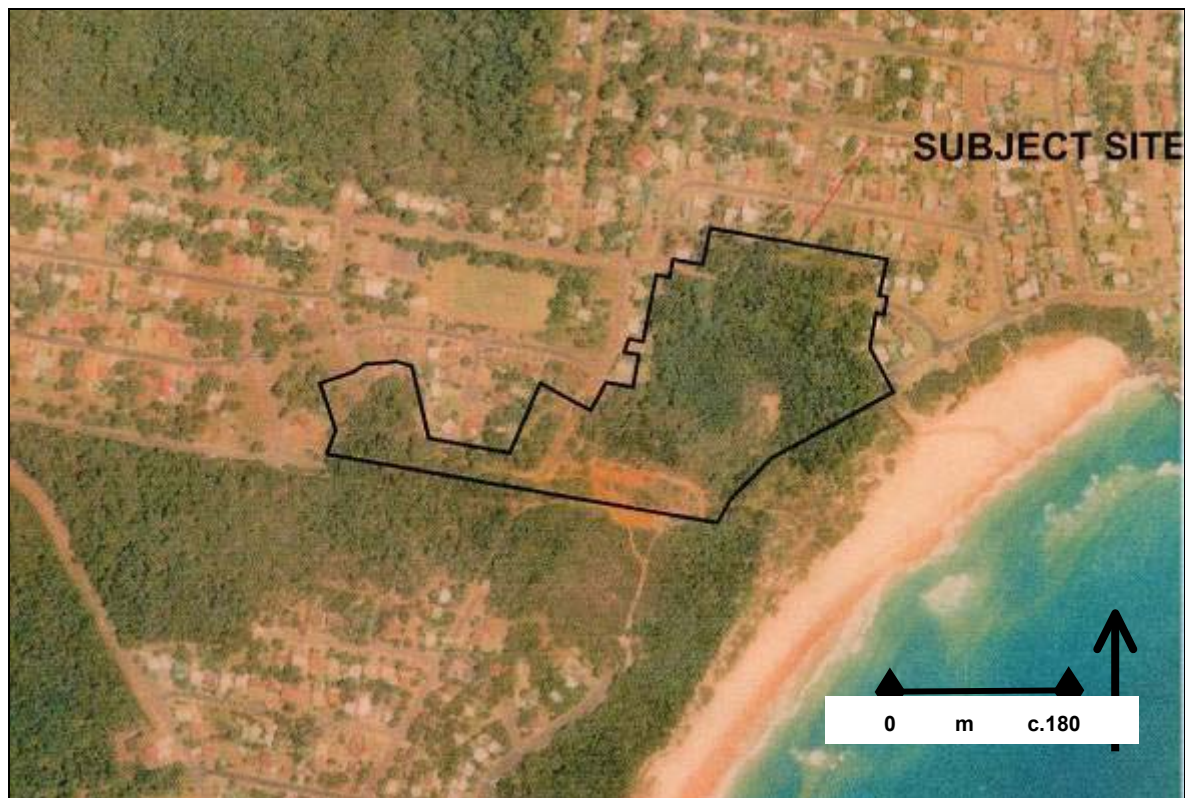


Figure 3.1. Aerial photo of the study area
(aerial photo supplied by Watkinson Apperley)



4. ARCHAEOLOGICAL CONTEXT

4.1 Regional Overview

The south coast of New South Wales has been the subject of extensive archaeological research over the last thirty years, with much of it concentrated along the coastline and estuaries. This includes investigations of specific areas prior to development, excavations of Aboriginal sites, mainly shell middens and rock shelters, and detailed and systematic regional surveys.

The majority of archaeological sites located in this region date to the last 6,000 years, when the sea levels stabilised at about the present level (the Holocene stillstand). Sites older than 6,000 years are rare, as rising seas would have submerged most of them. To date two coastal sites, Bass Point and Burrill Lake, provide evidence of Pleistocene Aboriginal occupation of the south coast dating to 17,000 and 20,000 years BP (Before Present) respectively. Prior to the rise in sea levels these sites would have been located some 14 km inland.

Archaeological investigations in the broader Milton/Ulladulla and Conjola/Bendalong/Manyana region have been summarised previously and will not be included here. The reader is referred to the following studies for regional archaeological context - Lampert 1971; Officer 1991a & b; Boot 1994; Kuskie 1994, 1995, 1996, 1997a, b; Navin Officer Heritage Consultants 1998, 1999a, b, c; 2000, 2001a,b, c; 2002, 2004, 2005a, b and 2006).

4.2 The Study Area

4.2.1 Conjola Regional Sewerage Scheme Studies

Four Aboriginal archaeological investigations have been conducted in, or have included parts of, the Manyana Subdivision study area (Navin Officer Heritage Consultants 2001b, 2005a, 2005b and 2006).

Archaeological assessments carried out for the Conjola Regional Sewerage Scheme have included several areas that are located within the present investigation area at Manyana. Two artefact scatters (CS14 and CS25) and two PADs (PAD 1 and PAD 4) were recorded within or close to the present study area during field survey of these areas (Navin Officer Heritage Consultants 2004).

Site CS14 (AHIMS# 58-2-0375) was recorded as a large low to high density surface artefact scatter (c.500 artefacts) located on low gradient, north to northeast facing mid-slopes on the spurline which forms Cunjurong Point. Exposures of artefacts occurred within the northern and southern road reserve extensions of Austen Street and Manyana Drive (maximum area dimensions: 175 x 60+m). Artefacts were visible in eroded road easements, gullies and extensive areas of sheet erosion. Artefacts included flakes, cores, flake fragments, backed blades and retouched flakes. Artefact densities varied from 1/m² to 20/m². The site was associated with potential archaeological deposit.

Site CS14 was assessed as having high potential to be larger and high potential to be associated with subsurface archaeological deposit (PAD). The site was tentatively assessed as having moderate local significance but it was noted that subsurface testing would be required to make a complete assessment (Navin Officer Heritage Consultants 2001b).

Site CS25 (AHIMS# 58-2-0397) was a low density scatter of two visible artefacts located 5 m apart in an exposure (60 x 80+m) approximately 10 m west of the proposed sewer main alignment from the northern end of Alaska Street to Sunset Strip. The exposure was part of complex of exposures that adjoined site CS14. The area was very eroded, with lag gavels laying on top of a trampled clay horizon.

It was considered that site CS25 may be an extension of site CS14, which was located about 140 m to the west of the proposed new sewer main. Both sites were located on the same topographic feature, ie a low gradient, north to northeast facing mid-slopes on the spurline which forms Cunjurong Point. Taking account of the numbers of artefacts visible at CS14, it was considered likely that artefactual material would be present across this entire landscape feature. The area around CS25



was consequently identified as PAD 4. The significance of the site was not determined due to the lack of information about the true nature and extent of the site (Navin Officer Heritage Consultants 2004).

PAD 1(AHIMS# 58-2-0398) was located on the alluvial flats adjacent to a tributary creekline and small estuary lagoon behind Manyana Beach. The PAD was located on the proposed pipeline route along alluvial flats at Manyana (Navin Officer Heritage Consultants 2001b). PAD 4 was identified along the pipeline easement associated with the site CS25. The assessment mapped the PAD dimensions as confined to the pipeline easement (50 m) but is highly likely to expand beyond this corridor (Navin Officer Heritage Consultants 2004).

An extensive subsurface testing program for the Conjola Regional Sewerage Scheme was undertaken during 2005 and included parts of the current study area (Navin Officer Heritage Consultants 2005b). Four auger holes were excavated at PAD 1. The deposit was wet sieved but no cultural material was located. It was concluded that this was most likely due to the low lying nature of the topography. The vegetation was also thick and infested with ticks and leeches, probably contributing to a poor occupation locale. Fourteen auger holes were excavated along a proposed pipeline route at PAD 4. Artefacts were retrieved from two of the auger holes which were situated on the crest and upper northern spur slope of the spurline.

PAD1 and PAD4 were found to contain low artefact areal incidence and were both situated within a generally disturbed context. It is considered unlikely that additional archaeological assessment of these areas would reveal increased artefact numbers or provide data to answer research questions. No further archaeological investigation was therefore considered necessary at PAD1 and PAD4.

Surface collection at Site CS26 was conducted under a program of archaeological salvage for the Conjola Regional Sewerage Scheme during 2006 in accordance with subsurface testing recommendations provided in 2005 (Navin Officer Heritage Consultants 2006). Five silcrete flakes were collected at the southern end of the 'Bulwark' road next to a small creekline at Manyana. Little could be extrapolated from such a small sample however analysis of the complete Conjola Regional Sewerage Scheme assemblage indicated that on-site manufacture of stone artefacts was probably represented at all sites and furthermore, sites with a small sample size that were characterised by an absence of cores and hammerstones reflected on-site reduction of material.

4.2.2 Manyana Subdivision Studies

Field survey for the Manyana subdivision development was conducted in 2005 (Navin Officer Heritage Consultants 2005a) recording five previously unidentified Aboriginal sites (MS1-MS5) and extending the boundaries of the two previously recorded sites CS14 and CS25. The new sites included four artefacts scatters (MS1, MS3, MS4 and MS5) and a single isolated find (MS2). It was noted that two of the sites (MS5 and CS25) occurred within the Environmental Protection area to be dedicated to Shoalhaven City Council and therefore were not likely to be impacted by housing development or other infrastructure. It was likely that the remaining five sites and two areas of potential archaeological deposit would be impacted by the current proposal.

The survey found that there was potential for artefacts to be located across most of the study area, however the significance of the sites could not be determined based on the surface manifestations. It was therefore recommended that further archaeological assessment in the form of subsurface testing would be required to more accurately identify the nature and extent of the sites. The testing program would aim to identify the extent, nature and significance of the archaeological deposits and sites across the study area.

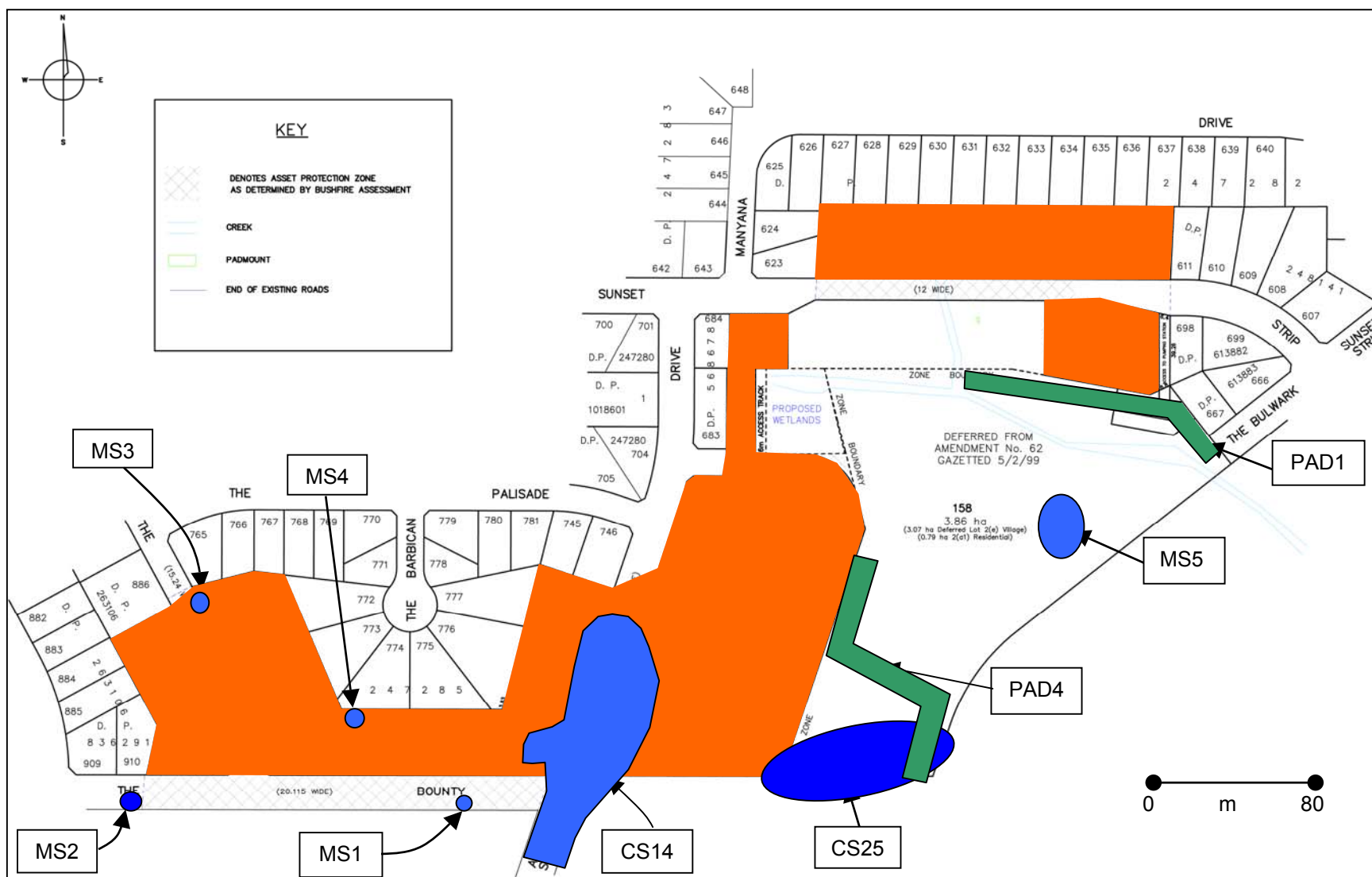


Figure 4.1 Location of Aboriginal sites [blue] and PADs [green] within the Manyana development area [orange] (plan supplied by Watkinson Apperley)



5. STUDY METHODOLOGY

5.1 Objectives of subsurface testing program

The aims of the Manyana Subdivision archaeological subsurface testing program were to determine if Aboriginal sites or Aboriginal Objects (as defined by the NPW Act) were located subsurface within the identified test areas.

Specific aims were to:

1. Characterise the nature of any archaeological deposits encountered (within the limitations of the sampling and processing methodology).
2. Identify the need for any further archaeological work, such as salvage excavation.
3. Provide informed mitigative measures and management recommendations for any sites located within the proposed development zone.

5.2 Project Personnel

Fieldwork was conducted by archaeologists Matthew Barber, Kelvin Officer, Nicola Hayes and Rebecca Yit, and field assistant Daniel Powell. William Connolly, Edward Stewart, Alfred Wellington and Noel Wellington represented Jerrinja Local Aboriginal Land Council in the fieldwork.

Lithic identification and analysis was conducted Dr Chris Clarkson. This report was prepared by Rebecca Yit and Kerry Navin.

5.3 Excavation Methodology

The excavation program was conducted over the course of five days during November 2007 and January 2008. Twenty seven (27) archaeological test pits were excavated on a rough 40 m grid by backhoe and mechanical excavator using a straight-edged 850 mm wide toothless bucket. The depth interval for each spit was 5-20 cm and each pit was approximately 3 m long.

The methodology was subject to minor change depending on factors encountered in the field which had not been anticipated. For example, three pits were placed east of pits 19, 23 and south of pit 22, within the heavily disturbed quarried area, characterised by a thin grey loam overlying massive clay or complete removal of the upper soil profile. Figures 5.1 and 5.2 provide views of the ground surface and soil composition within this area. Following the excavation of pits 19, 22 and 23 and the absence of cultural material in these areas there was reasonable evidence to reject the other locations based on the limited potential for subsurface deposits to be present.



Figure 5.1 View west towards pit 19 prior to excavation



Figure 5.2 View from area north of pit 19, looking east across heavily quarried area in the south eastern portion of the study area



The excavation sequence was conducted as follows (refer Figure 5.3):

- Excavation of spit one along an interval that averaged 1.5 to 2.0 m in length;
- Following the removal of spoil from each spit, a 5-10 cm strip was removed from one side of the pit. This was done where there was a potential risk of significant contamination from material dropping from previous and upper spit levels. The strip was removed to ensure that the backhoe bucket does not contact the pit sides during the next spit excavation, therefore minimising potential contamination from upper levels;
- Following the removal of spoil from each spit, loose surface material or other unwanted sediment was removed prior to the commencement of the following spit excavation;
- Excavation of spit 2 (and all subsequent spits), beginning approximately 50-150 mm from the far end of the previous spit, and ending before the near end of the pit is encountered. This was done in order to create a 'clean' end-wall and to prevent contamination from loose sediments at the ends of the pit; and
- Following excavation of spit 2 (and after all subsequent spits), the near end of the pit was extended by up to 300 mm in order to remove any fallen sediment from upper levels and to provide a 'clean' end point for the backhoe bucket.

Following each spit excavation, a consistent sample of the excavated sediment was recovered for sieving. The size of the recovered sample varied according to the depth of the spit so that the volume was equivalent to the *in situ* deposit that would be recovered from an excavation area of 100 x 48 cm. These varying sample sizes are shown in Table 5.1 below. In the case of a spit with the preferred depth interval of 15 cm, the sample size was eight 10 litre buckets.

The material for sieving was preferentially taken from the middle of the backhoe/excavator bucket, prior to the emptying of the bucket. This minimised the potential for contamination from sediments falling to lower levels from the pit sides. All material remaining in the bucket after recovery of the sample for sieving (if any) was set aside in a separate pile.

Excavation of each test pit ceased according to an on-site appreciation of testing requirements. In most cases, excavation ceased when dense clay or bed rock was encountered.

All sieving was conducted with the aid of pressurised water from a water truck. All material was sieved through 4 mm mesh, with the use of a top 12 mm mesh when required by the presence of large gravels.

All identified or suspected cultural material recovered from sieving was retained, bagged and labelled. In addition, samples of sediment were taken for the purposes of palaeo-environmental analysis. A reference collection of natural gravels were collected to aid in lithic interpretation, where appropriate.

Following cessation of excavation, the soil profile and characteristics were described and checked with the separately documented incremental spit descriptions. pH measurements were taken from representative pits at various locations in the profile. All pits were backfilled with the remaining excavated spoil.



Average depth interval across spit	No. of 10 litre buckets*	Loose volume (litres)	Equivalent <i>in situ</i> volume (litres)
2.5 cm	1.3	13.3	12
5 cm	2.7	26.7	24
7.5 cm	4.0	40.0	36
10 cm	5.3	53.3	48
12.5 cm	6.6	66.6	60
15 cm	8.0	80.0	72
17.5 cm	9.3	93.3	84
20 cm	10.7	106.6	96
22.5 cm	12	120.0	108
25 cm	13.3	133.3	120

*Multiply spit depth (cm) by 0.535 to get number of required 10 litre buckets

Table 5.1 Sample size of sediment recovered from each spit relative to spit depth

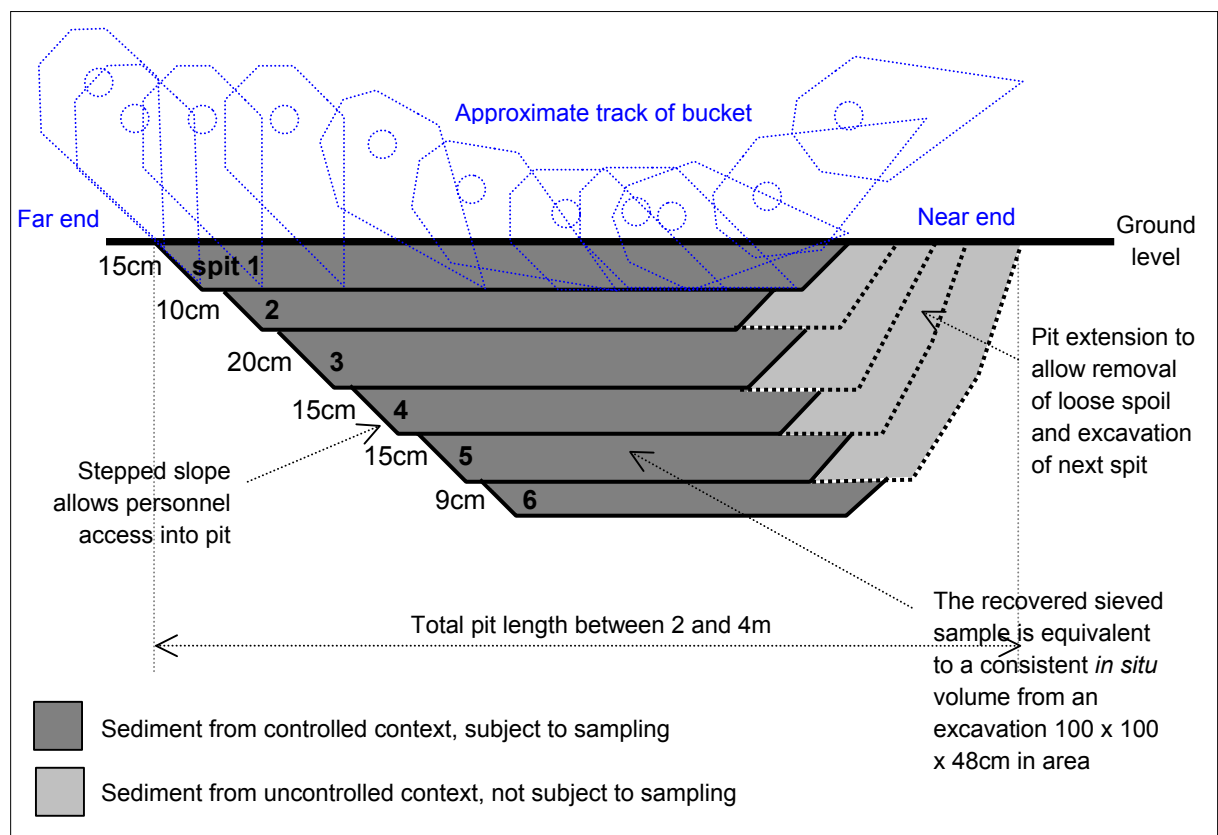


Figure 5.3 Indicative pit profile showing sampling methodology and sequence for mechanical pit excavation (not to scale)

5.4 Lithic Analysis Methodology

Analysis of the Manyana Subdivision salvaged stone artefact assemblage involved the macroscopic inspection and classification of stone artefacts into 44 technological classes, or “assemblage elements”. These categories help capture the variability in chipped and ground stone assemblages



found on the NSW coast. The approach to classification adopted here first orders artefacts resulting from conchoidal fracture into cores, flakes and retouched flakes. This scheme views these three categories as mutually exclusive, chronologically distinct stages in the reduction of stone materials. Cores are defined as artefacts possessing only negative conchoidal scars. Six types of cores are recognized in the analysis: single platform, multiplatform, bidirectional, discoidal and uni- and multi-directional bipolar cores. Large flakes that have been extensively spalled along their margins are recorded as burinate cores as well as retouched flakes.

Flakes are defined as artefacts possessing one or more of the following fracture features: ring-crack, platform, éraillure scar, waves of force, or a clearly discernable ventral and dorsal surface. Flakes that remove old platform edges are termed 'redirecting flakes'. The old platform angle is measured along the dorsal spine for these flakes using a goniometer.

Retouch is defined as any scar longer than 2 mm deriving from the lateral margins that were formed subsequent to the creation of the ventral surface. Scars less than 2 mm are classified as edge-damage.

Artefacts that clearly derived from conchoidal fracture but lacked the distinguishing features of flakes or cores listed above are recorded as flaked pieces.

Several categories describe artefacts at least partly manufactured by processes other than flaking, such as ground implements (edge ground axes), fabricators (hammerstones and anvils), and artefact fragments created by heat fracture (pot lids, flaked pieces, and fire-cracked rocks).

The completeness and cause of breakage (eg cone-split, transverse snap or heat fracture) is recorded for all artefacts and only those features present are recorded for broken fragments. Percussion length (or maximum length in the case of cores and flaked or non-flaked pieces) and weight are taken as an indication of size for all artefacts whether complete or broken. The amount, type and location of cortex is also recorded for each artefact. Platform type (single or multiple conchoidal, focalised and single or focalised and multiple, cortical and crushed) and the presence/absence of platform preparation is recorded for cores and flakes. The length and width of the largest flake scar found on cores is also recorded. Termination types are recorded for all complete and distal sections of flakes.

The height and perimeter of retouch is recorded for retouched flakes and the degree of retouch is calculated using Kuhn's (1990) geometric index of reduction and Clarkson's (2002a) Index of Invasiveness. The mean edge angle and curvature of the retouched edge is also recorded for retouched flakes, as is the location and orientation of retouch (e.g. left distal, dorsal only etc) (Clarkson 2002b).

For hammerstones and anvils, size and location of pitted areas is recorded.

Several formal retouched and ground artefact forms are recognized. These conform to implement types commonly found in southeastern Australian assemblages. These are symmetric and asymmetric backed artefacts, eloueras, ground edge axes and bifacial axe blanks, burins and burin spalls, burrens and various forms of retouched flakes traditionally called 'scrapers' but here referred to according to the location of retouch and the presence of notches (ie side, end, double side, double side and end, double side and double end, double end and notched). These typological categories are entirely morphologically defined according to retouch location and type and no assumptions are made about artefact function. It is recognized that various types may form arbitrary divisions of morphological continuums or stages within a reduction sequence (Clarkson 2002b, 2005; Hiscock and Attenbrow 2003).

Raw material type is recorded for each stone artefact, however, no attempt is made to identify varieties of stone beyond broad categories such as 'quartz', 'basalt', 'silcrete', 'chalcedony', 'chert' etc. Artefacts made from raw materials that were more difficult to identify were classified as either 'fine-grained-sedimentary' or 'fine-grained-volcanic' stone.



Attributes for each artefact in the assemblage are entered into a relational database and digital photographs are taken of selected artefacts. Information for each specimen recorded in the analysis can be found in Appendix 2.

5.5 Areal Incidence of artefacts

The analysis of the incidence of artefacts across the test pits and test sites is best conducted using an areal measure of incidence rather than a volumetric measure, such as density. This approach is required for two reasons: the variable volumes of the excavation units, and the inability to relate artefact depth with chronology.

The methodology of excavation resulted in variable spit intervals and differing maximum pit depths. This variation is a consequence of a number of factors including the skill of the mechanical auger operator, the resistance of the sediments, and other unrelated factors such as the need to gain geomorphological and soil profile information. Given that the volumes of excavation units are inconsistent and unrelated to the incidence of artefacts, density calculations generated from this data are of limited application and would relate more to the methodology of excavation than actual artefact occurrence. An example would be two spit samples, from different pits, each including the same 50 mm lens of identical artefact density. Spit 1 from Pit A consists of a 100 mm interval, where as Spit 1 from Pit B consists of a 150 mm interval. The density of spit 1, Pit A will be greater than for Spit 1 Pit B, despite each providing a sample of the same deposit. In another example, two pits of different maximum depths, each sampling the same incidence of artefacts, will return very different density figures. The reason for the difference in pit depth may be due to changes in geomorphology, or decisions made by the excavation director. In either case the difference in density values will not be of use in interpreting the behaviours responsible for the evident artefact discard.

In addition to these methodological considerations, the bioturbated nature of most artefact distributions in open site contexts means that variations in density across any particular soil profile generally will reflect post depositional soil processes rather than cultural or chronological relationships.

In order to avoid problems associated with density calculations, a measure of areal artefact incidence has been adopted for this project. This allows comparisons across pits and test sites using data which demonstrably relates to cultural variation rather than methodology or geomorphological variables. The number of artefacts per test area (calculated as a number per square metre) has been calculated for each test pit, together with various minimum, maximum and average tallies per test site.

The number of artefacts encountered per spit interval has also been plotted for test locations where relatively substantial artefact numbers were encountered. While this data relates to density and is therefore subject to the problems outline above, its presentation remains useful in a generalised sense and provided that the coarse scale of definition is considered.

5.6 Curation of the lithic artefact collection

After examination and measurement the lithic items have been stored individually in standard resealable plastic bags. These containers have been labelled in permanent black pen with the item's unique identification number and details of its provenance within the excavation.

All the lithic items will be lodged with the Jerrinja LALC for care and curation following completion of the project.



6. RESULTS AND CONCLUSIONS

Twenty seven (27) archaeological test pits were excavated in the Manyana Subdivision area from a total of thirty (30) proposed test locations. The locations of test pits are shown on Figure 6.1.

Four hundred and seventy nine (479) lithic items, including 126 artefacts, were recovered from 21 of the 27 test pits excavated at Manyana, excluding pits 9, 19, 22, 24, 25 and 26.

Lithic items are described in Appendix 2.

Tables showing the frequency of artefact assemblage elements by pit and spit (Table A3.1) and percentages of artefact types from each pit and spit at Manyana (Table A3.2) are provided in Appendix 3.

A summary of test results for each pit is provided in Appendix 4.

An additional sample of excavated deposit was taken from pit 17 spit 2, in order to provide a larger lithic sample for analysis. The result of the larger sample means there is some bias in the results towards greater quantities recovered within pit 17.

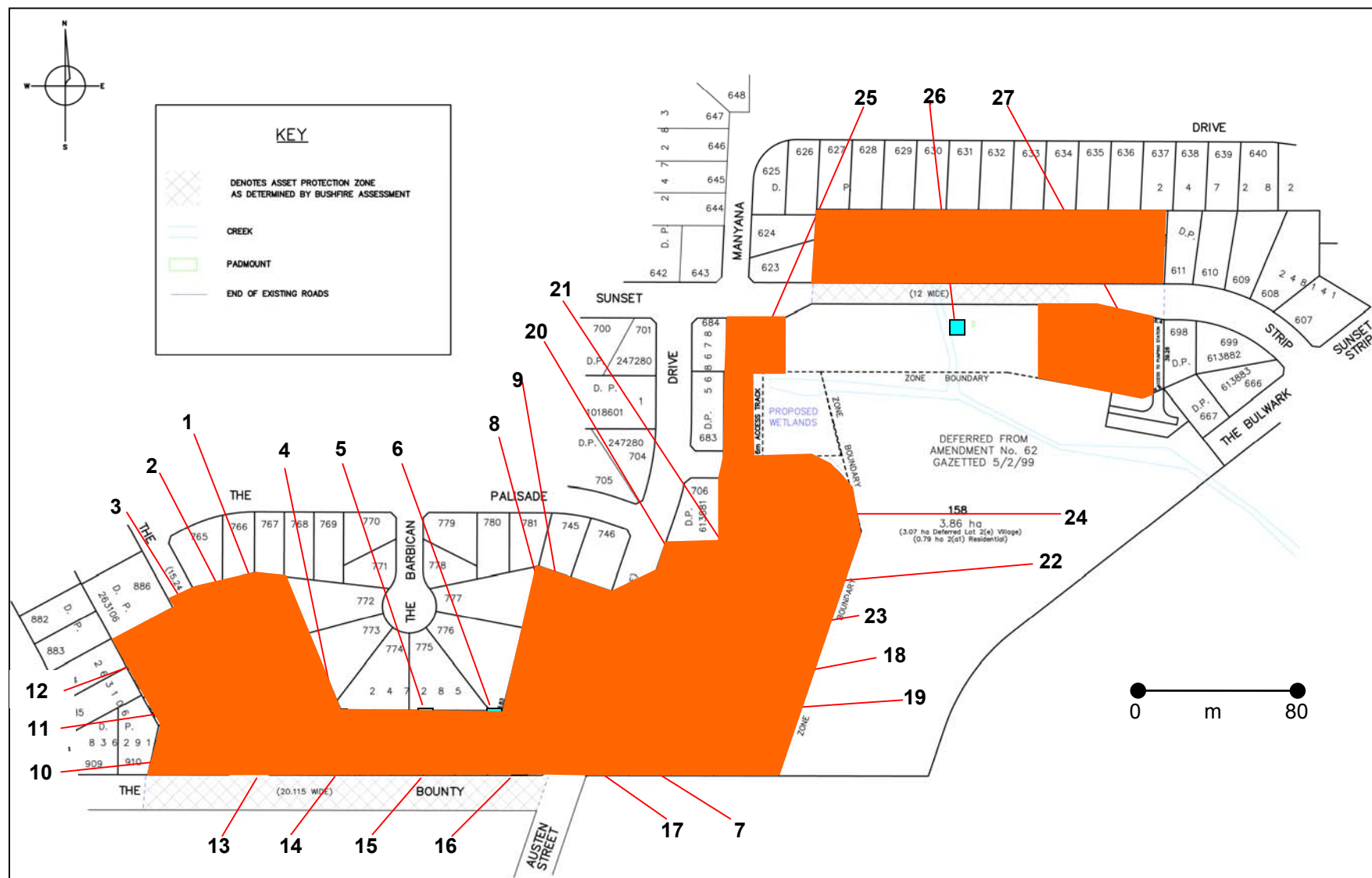
6.1 Soil Profile

Pit data and soil profile descriptions are provided in Appendix 5.

A summary of generalised soil profiles across the study area is provided in Table 6.1.

Test Pit ID	Depth (cm)	Soil Profile Summary
1-7 9,10 14-18 20-27	45/50	grey/brown silty loam, increasing clay mottling and ironstone gravels with depth, above yellow brown loamy clay containing many ironstone gravels, onto yellow red clay
8	68	red/brown mottled clayey silt grading to yellow grey clayey silt above dark brown clayey, silty loam, increasing gravels and clay with depth, grades to yellow brown clay
11-13	45	grey sandy loam above gravelly sandy loam grading quickly to a massive yellow brown to yellow clay
19	15	thin grey silt layer above red orange massive clay

Table 6.1 Summary of generalised soil profiles



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6.2 Stone Material Types and Categories

Three stone material types were recovered from the subsurface investigation within the Manyana Subdivision Area (Table 6.2 and Figure 6.2). The majority of the assemblage is overwhelmingly dominated by silcrete (97.9%) with a small quantity of quartz (1.9%) and a single basalt flake (0.2%).

These results are comparable to those of the subsurface investigation in the Conjola Regional Sewerage Scheme where silcrete made up 87% of the assemblage with four other material types represented in small quantities [quartz 8%, quartzite 4%, chert and chalcedony 0.2% each] (Navin Officer 2005).

Raw Material Type	Quantity	% of Total
Basalt	1	0.2
Quartz	9	1.9
Silcrete	469	97.9
Total	479	100

Table 6.2 Stone material types across the study area and within each area

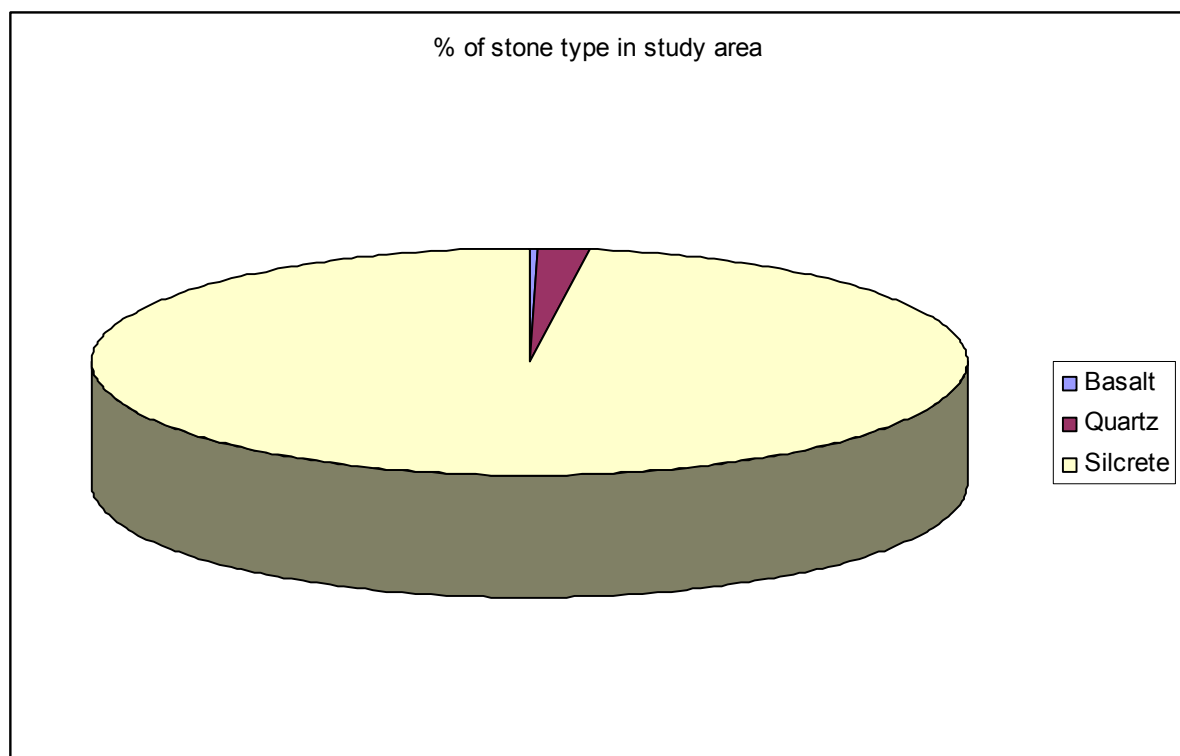


Figure 6.2 Percentage of stone types within the Manyana study area

The majority of silcrete within the Manyana assemblage varied in shades from deep red to pink in colour. Texture varied from coarse to fine, but a general observation was that the coarse red silcrete was the predominant raw material. Discoloration may also be an indicator of heat treatment but the typical lustre associated with this process was not obvious within the assemblage.



6.3 Classification of Lithic Items

Twenty two (22) lithic item types were identified in the Manyana assemblage (Figure 6.3) including: lithic fragment, manuport, flake, flaked piece, flake fragment, flake portion, broken flake, broken flaked piece, microblade, broken microblade, chip, core, core fragment, backed artefact, broken backed artefact, utilised flake and utilised artefact.

The Manyana assemblage is dominated by broken flakes and flaked pieces (85%) but fire cracked rocks, microblade fragments (2%), redirecting flakes (2%), broken backed artefacts (1.3%) and retouched and unretouched artefact forms are also present in small numbers.

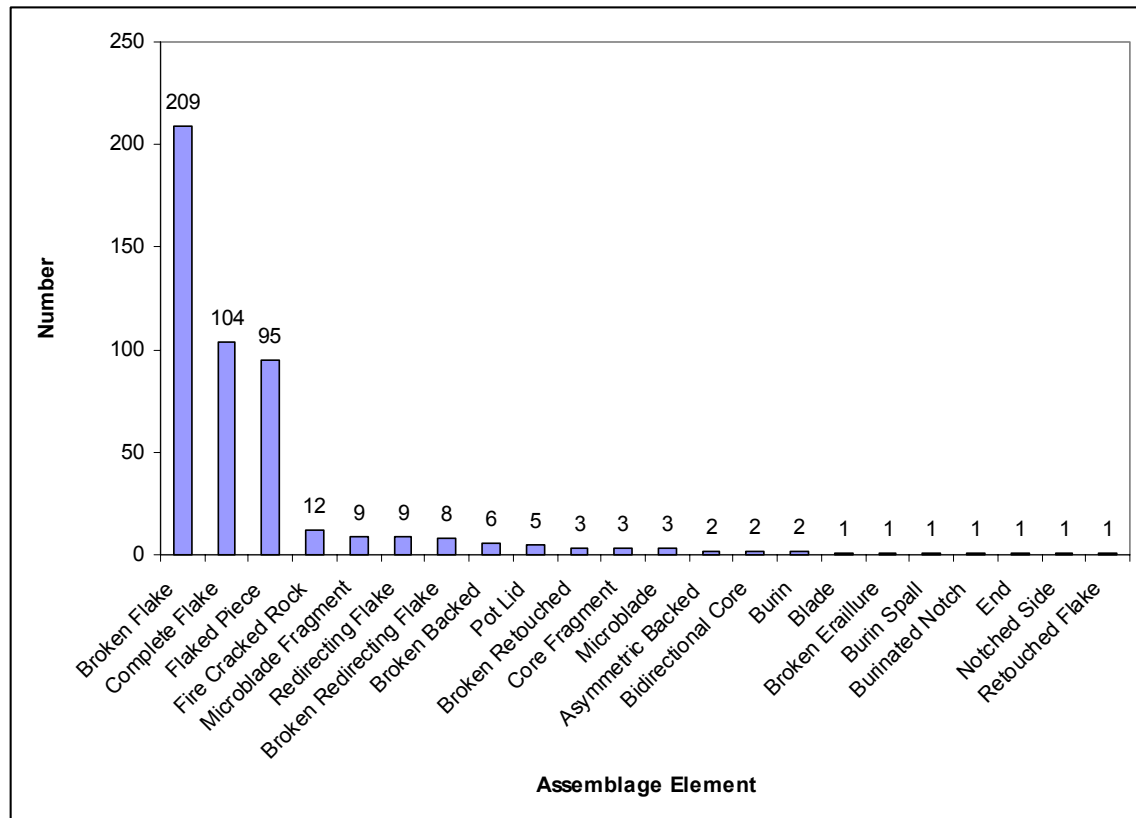


Figure 6.3 Stone material types recovered from Manyana

6.4 Technological Characteristics

6.4.1 Intactness of the Manyana Assemblage

In general the lithic items recovered from the Manyana area are very small in size, and lightweight, as is typical for flaking debitage and heat fractured lithic items in recent prehistoric lithic assemblages, and typical of the NSW South Coast.

There are 2.8 broken fragments in the Manyana assemblage for every complete artefact (Table 6.3). This is a very high level of fragmentation for East Coast sites (the second highest out of a sample of 21 coastal sites). Around 24.2% of artefacts are fragmented so as to be no longer identifiable to the technological level.

While artefacts are heavily fragmented, the edges of artefacts are typically intact and there is little edge damage present (0.8%). Most of the edge damaged artefacts occur in Pits 16 and 17.

Only 2.3% of identifiable breaks on flakes (as opposed to unidentifiable breaks on flaked pieces) can be explained as the sole product of manufacturing failures (i.e. longitudinal cone splits that take place due to the application of excessive force), whereas 47% may have resulted from manufacture, use or trampling (i.e. transverse or a combination of transverse and longitudinal breaks).



Around 26% of artefacts show signs of heating, and this may have contributed to the high rate of damage in the assemblage. Around 5% of artefacts have breaks clearly caused by heat as determined by the presence of one of a number of indicators such as spalling, potlids, crenated fractures, crazing and colour change.

Pit	Complete Artefacts and Unidentifiable Breaks	% of total	Fragmented artefacts	% of total	TOTAL
1	1	0.2	0		1
2	21	4.4	23	4.8	44
3	8	1.7	6	1.3	14
4	7	1.5	5	1	12
5	28	5.8	29	6.1	57
6	11	2.3	9	1.9	20
7	1	0.2	0		1
8	4	0.8	0		4
10	7	1.5	8	1.7	15
11	1	0.2	0		1
12	2	0.4	4	0.8	6
13	10	2.1	7	1.5	17
14	11	2.3	9	1.9	20
15	3	0.6	3	0.6	6
16	4	0.8	4	0.8	8
17	103	21.5	111	23.2	214
18	2	0.4	2	0.4	4
20	9	1.9	9	1.9	18
21	5	1	4	0.8	9
23	4	0.8	3	0.6	7
27	1	0.2	0		1
TOTAL	243	50.7	236	49.3	479

Table 6.3 Frequency of different fragment types

6.4.2 Weight

The weight of lithic items is considered a much more useful tool to use for assessing the nature of this assemblage than raw counts or size class. The majority of the assemblage (74%) measures less than 2 cm in length. However, the centimetre increments used for size class recording do not accurately reflect the actual size of the artefacts in the assemblage. In fact many of the artefacts were less than one centimetre in length and often less than 5 mm. An analysis of weight provides a much more accurate picture of the small size of the flaked material present within the study area. Just under one quarter of the assemblage (24%) weighs less than 0.2 g (Figure 6.4) supporting the proposition that the material is typical of the South Coast region.

The lithic fragments are not considered definitive artefacts and have been removed from the following analyses. This leaves a total of 126 artefacts for the analysis and with which to make observations about the Aboriginal occupation of the study area.

Technological attributes of the artefacts from Manyana were recorded in detail on 126 complete artefacts. In addition, relevant information was also recorded on intact portions of artefacts where appropriate. It is possible using this information to perform a brief analysis of the technological features of flakes and cores from the site and to make some comments about manufacturing technology at the site.

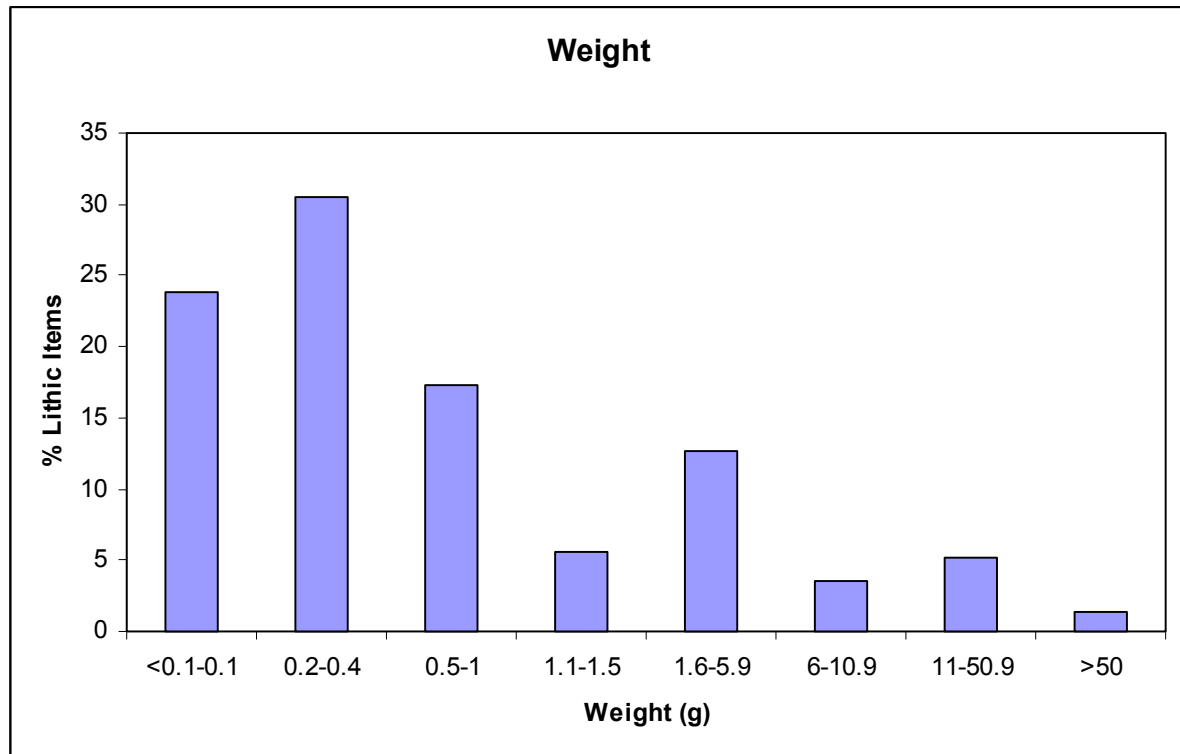


Figure 6.4 Weights of lithic items within the Manyana Subdivision area

6.4.3 Flakes

The majority of lithic material recovered during the excavation program was flakes or flaked material. The size of flakes from Manyana varies from 0.1 g and 1.4 mm in length to 43 g and 56 mm in length. The mean size of flakes is 1.7 g and 15.1 mm percussion length. Flake platforms are small relative to the ventral area of flakes (13%) and the high proportion of overhang removal (30%) suggests concern for manufacturing flakes by striking close to the edge of core platforms. Examples of flakes are provided in Figure 6.5 and summary statistics on mean flake attributes are provided in Table 6.4.

Attribute	No.	Minimum	Maximum	Mean	Std. Deviation
Weight	326	0.1	43.2	1.7	4.5
Length	325	1.4	56.6	15.1	9.5
Prox. Width	171	0.5	34.8	9.1	5.8
Med. Width	207	0.9	36.8	11.7	6.6
Dist. Width	148	0.0	88.0	9.3	10.1
Thickness	231	0.0	13.8	3.3	2.4
No. Arises	146	0.0	3.0	1.1	0.5
Plat. Width	153	0.4	28.8	8.3	5.5
Plat. Thickness	162	0.1	11.8	2.7	2.3
Plat. Angle	161	33.0	97.0	69.1	11.5
% Cortex	282	0.0	100.0	4.8	19.1
Marginal Angle	326	-160.67	82.05	3.83	27.11
Elongation	207	0.34	5.45	1.41	0.66

Table 6.4 Summary statistics for complete flakes from Manyana test excavations



Figure 6.5 Examples of flakes recovered from Manyana test excavations

6.4.4 Retouched Flakes

Six retouched flakes (scrapers and burins) were recovered from the Manyana subsurface testing program. Retouched flakes are typically larger than unretouched flakes, with a mean weight of 26 ± 63 g and a mean length of 27 ± 26 mm. They also tend to be more elongate (1.55) with less parallel and more tapering margins (refer to Table 6.5 for summary statistics on retouched flakes).

Two of the retouched artefacts possess concave retouched sections, often called notches. One of these is quite pronounced, and shows small scars overlying a larger scar that may result from use of the notch as a spokeshave. This notch was also used as a platform for burinate retouch of the left margin (refer to Figure 6.6, #137). A second burin was also recovered, and exhibits multiple small burin spalls struck from the distal end along the left lateral margin (Figure 6.6 #293).

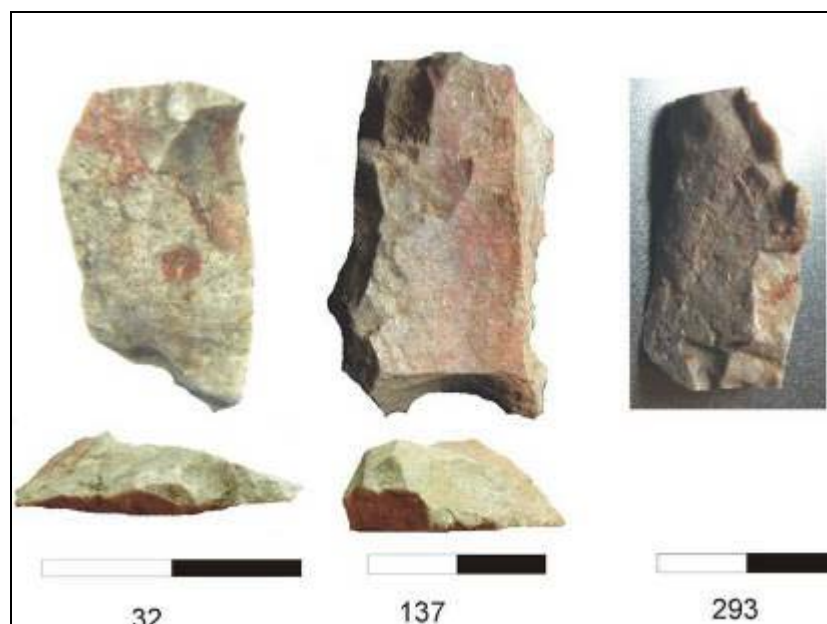


Figure 6.6 Retouched flakes - end scraper on left, notched side scraper in centre and burin on right



Attribute	No	Minimum	Maximum	Mean	Std. Deviation
Weight	6	0.2	154.8	26.7	62.8
Length	6	11.0	79.4	27.4	25.9
Proximal Width	3	13.2	53.0	26.8	22.7
Width	3	12.3	59.9	29.3	26.6
Distal Width	2	9.3	31.1	20.2	15.4
Thickness	3	4.2	28.0	12.5	13.4
No. Dorsal Ridges	2	1.0	1.0	1.0	0.0
Platform Width	3	8.5	43.5	21.7	19.0
Platform Thickness	3	2.1	9.4	5.0	3.9
Platform Angle	3	73.0	83.0	78.0	5.0
% Cortex	4	0.0	30.0	7.5	15.0
Marginal Angle	6	0.0	34.1	9.9	13.5
Elongation	3	1.32	1.88	1.55	0.29
Invasiveness Angle	2	0.03	0.16	0.09	0.09
% Perimeter Retouched	2	18	34	26	11
Retouched Edge Curvature	2	-0.14	0.16	0.01	0.22
GIUR	6	0.00	0.66	0.18	0.29
Retouch Edge Angle	6	0.0	79.3	23.9	37.4

Table 6.5 Summary statistics for retouched flakes (scrapers)

Two complete and six broken backed artefacts were also recovered from Manyana. Both complete backed artefacts are asymmetric forms, and while it was not possible to determine with accuracy the typological nature of the broken forms, they also appear likely to be asymmetric forms (i.e. Bondi points). This recovery rate for backed artefacts (i.e., 8 backed artefacts in 479 artefacts) is very standard for South East Coast sites, and is unlikely to be reflective of anything other than standard rates of backed artefact manufacture use and discard. We do not see the high rates of backed artefact production one might expect to find for instance at a quarry where backed artefacts were being manufactured in large numbers.

All backed artefacts are small (weight = $2.6 \pm 2g$), but while several appear to be made on microblades (e.g. Figure 6.7 #402), this is by no means the general rule, and several are made on wide flakes (e.g. Figure 6.7 #165) and very small irregular flakes (e.g. Figure 6.7 #300). Backed artefacts tend to be very parallel sided, and perhaps due to the high breakage rate, elongation is very low (summary statistics on attributes of backed artefacts is provided in Table 6.6). Retouch is also minimal compared to backed artefacts from other South East Coast sites, with a mean retouch perimeter of only 23%. The retouched edge also tends to very straight, consistent with only a small portion of the edge having been retouched.

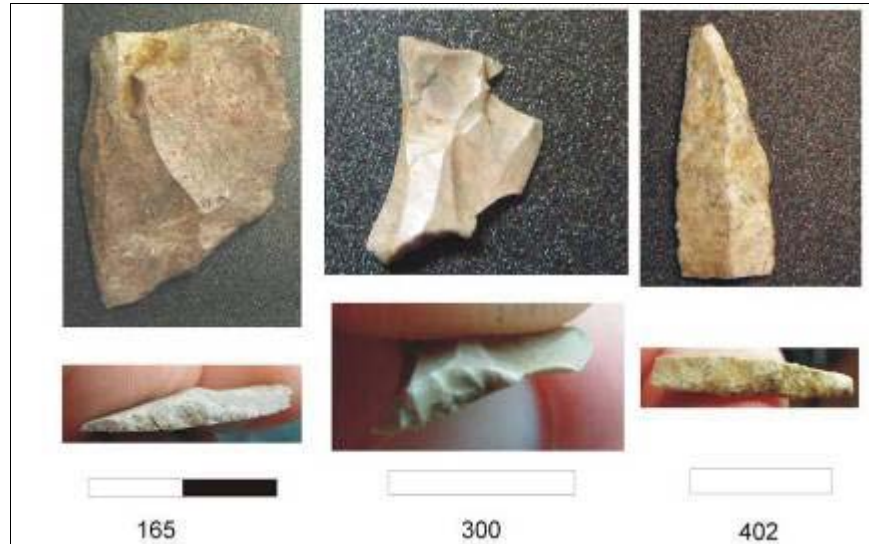


Figure 6.7 Backed artefacts - asymmetric backed made on a short, wide flake on left, asymmetric backed made on irregular flake in centre and probably an asymmetric backed made on a microblade on right

Attribute	No.	Minimum	Maximum	Mean	Std. Deviation
Weight	2	1.2	4.0	2.6	2.0
Length	2	14.3	24.9	19.6	7.5
Proximal Width	4	4.1	20.0	10.7	7.7
Width	6	7.1	21.9	12.4	6.9
Distal Width	5	0.0	15.8	7.5	6.6
Thickness	7	1.4	5.8	3.4	1.5
No. Dorsal Ridges	5	1.0	1.0	1.0	0.0
Platform Width	3	2.8	19.4	11.7	8.3
Platform Thickness	3	0.8	4.4	2.6	1.8
Platform Angle	3	37.0	73.0	57.7	18.6
% Cortex	8	0.0	0.0	0.0	0.0
Ret. Length	6	5.6	21.0	12.6	6.3
No. Segments	6	3.0	8.0	4.7	2.6
No. Retouched Elements	6	1.0	4.0	2.7	1.0
Retouch Depth	5	-0.9	4.0	1.6	2.2
Marginal Angle	8	-35.20	29.58	0.10	19.12
Invasiveness Angle	6	0.06	0.33	0.18	0.11
% Perimeter Retouched	2	21	26	23	3
Retouched Edge Curvature	5	-0.14	0.29	0.07	0.16
GIUR	8	0.00	0.92	0.48	0.41
Retouch Edge Angle	8	0.00	88.67	59.21	37.12
Elongation	2	0.65	1.20	0.93	0.39

Table 6.6 Summary statistics for backed artefacts



6.4.5 Cores

There are strikingly few cores in the Manyana assemblage given that a source of silcrete is located close by, that the assemblage is quite large, and that a large area was excavated. There were also no hammerstones recovered from the site, reinforcing the conclusion that on-site core reduction was uncommon.

A single, silcrete complete core and three silcrete core fragments were recovered during the excavation (Figure 6.8). The core quite possibly provided a series of microblades and small flakes before step terminations appeared on the core face. A large silcrete core fragment (Figure 6.8 #34) was too badly damaged by heat spalling to infer much about core reduction at the site. It does however display heavy overhang removal on a remnant platform edge, consistent with the high rates of platform preparation seen on flakes indicative of on-site knapping activities at the study area (summary statistics on attributes of cores is provided in Table 6.7).

The very low number of cores within the assemblage is a negative result that can provide information about the use of the study area. It is suggested that manufacture of artefacts did not occur, or was at least very limited, within the study area and/or that cores were not discarded in the study area. This may indicate that either the cores were valuable and were taken away with the knapper, or that manufacture of implements was not required for the types of activities being undertaken within the area.



Figure 6.8 Cores (bidirectional core on left and core fragment on right)

Attribute	Minimum	Maximum	Mean
Weight	58.4	58.4	58.4
Length	52.0	52.0	52.0
Width	30.1	30.1	30.1
Thickness	26.7	26.7	26.7
% Cortex	30.0	30.0	30.0
Longest Face	52.2	52.2	52.2
Base Thickness	13.1	13.1	13.1
Platform Thickness	20.9	20.9	20.9
Platform Width	34.4	34.4	34.4
No. Non-Feather Terminations	3.0	3.0	3.0
No. Elongate Parallel scars	5.0	5.0	5.0



Attribute	Minimum	Maximum	Mean
Platform Quadrants	3.0	3.0	3.0
Last Platform Angle	93.0	93.0	93.0
Longest Scar	35.7	35.7	35.7

Table 6.7 Summary statistics for the single intact silcrete bidirectional core

6.5 Chronology of the Assemblage

There is no identifiable stratigraphic change in the overall character of the lithic assemblage from the Manyana Subdivision test areas. There is a little variation in the proportion of the microblade industry represented through the profile, but microblade material was found in all levels where artefacts were located.

The assemblage is therefore characterised as 'microlithic' in character (knapping debris and microblades). The 'diagnostic' elements in the assemblage, such as microblades, are typical of the Late Phase.

Given the composition of diagnostic elements it is inferred that the assemblage accumulated at some time within the last 3,000 years, after microliths had been adopted along the south coast of New South Wales (Mulvaney and Kamminga 1999).

6.6 Activities

It is possible to examine whether site use varies across the excavated area by examining the proportions of artefacts indicative of certain activities like flake manufacture, retouching, firing, etc. Only larger assemblages (i.e. >10 artefacts) are examined as small assemblages will likely reflect the vagaries of sampling. The proportions of different technological components are shown in Table 6.8. We can see from this table that there is indeed significant variability in assemblage composition.

Pit	Number of artefacts	% of Flaking products	% of Retouched	Average Weight	Heat
2	44	86	7	3.8	37
3	14	43	7	1.0	7
4	12	50		0.7	8
5	57	77	4	3.5	28
6	20	80		2.9	35
10	15	100		1.7	47
13	17	53	12	9.7	47
14	20	70	15	2.9	5
17	214	74	1	2.5	23
20	18	56	11	1.0	17
Mean	43.1	68.9	5.7	3	25.4

Table 6.8 Comparison of technological elements of the larger assemblages

Departures from the mean for each technological activity are shown in Table 6.9. Positive values mean the activity is more common than the mean for the site, and negative values mean the activity is under-represented compared to the mean. If we treat a deviation of 10% or more from the mean as significant, we can see significant departures from the mean in certain areas for certain activities. For



example, flake manufacture appears to be significantly more common in Pits 2, 6 and 10. It is under-represented in Pits 3, 4, 13 and 20.

Retouched artefact manufacture is not significantly different in any of the sampled areas, although Pits 13 and 14 show higher proportions of retouched flakes than other areas (6 and 9%), perhaps indicating that retouched flakes were manufactured or used in this area. Pits 2, 10 and 13 show significantly higher proportions of heat affected artefacts than other areas, whereas Pits 3, 4 and 14 show substantially lower proportions of heat damage. It is interesting that these pits with contrasting levels of heat affect are next to one another, perhaps suggesting that areas of firing were discrete and possibly related to camping and cooking hearths. Interestingly, the proportion of flaking products and the proportion of heat affected artefacts are strongly correlated ($r^2 = 0.776$). This could mean either that flaking usually took place around domestic hearths, with many artefacts subsequently falling into and being damaged by fires, or that knapping frequently involved attempts to heat treat raw materials.

Pit	Number of Artefacts	% Flaking products	% Retouched	Average Weight (g)	Heat
2	0.9	17.16	1.28	0.86	11.76
3	-29.1	-26.03	1.44	-2.00	-18.31
4	-31.1	-18.89	-5.70	-2.31	-17.12
5	13.9	8.30	-2.19	0.57	2.62
6	-23.1	11.11	-5.70	-0.06	9.55
10	-28.1	31.11	-5.70	-1.27	21.22
13	-26.1	-15.95	6.06	6.72	21.61
14	-23.1	1.11	9.30	-0.04	-20.45
17	170.9	5.41	-4.30	-0.44	-2.09
20	-25.1	-13.33	5.41	-2.00	-8.78

Table 6.9 Deviations from the mean in the representation of different technological activities in large assemblages from the Manyana study area

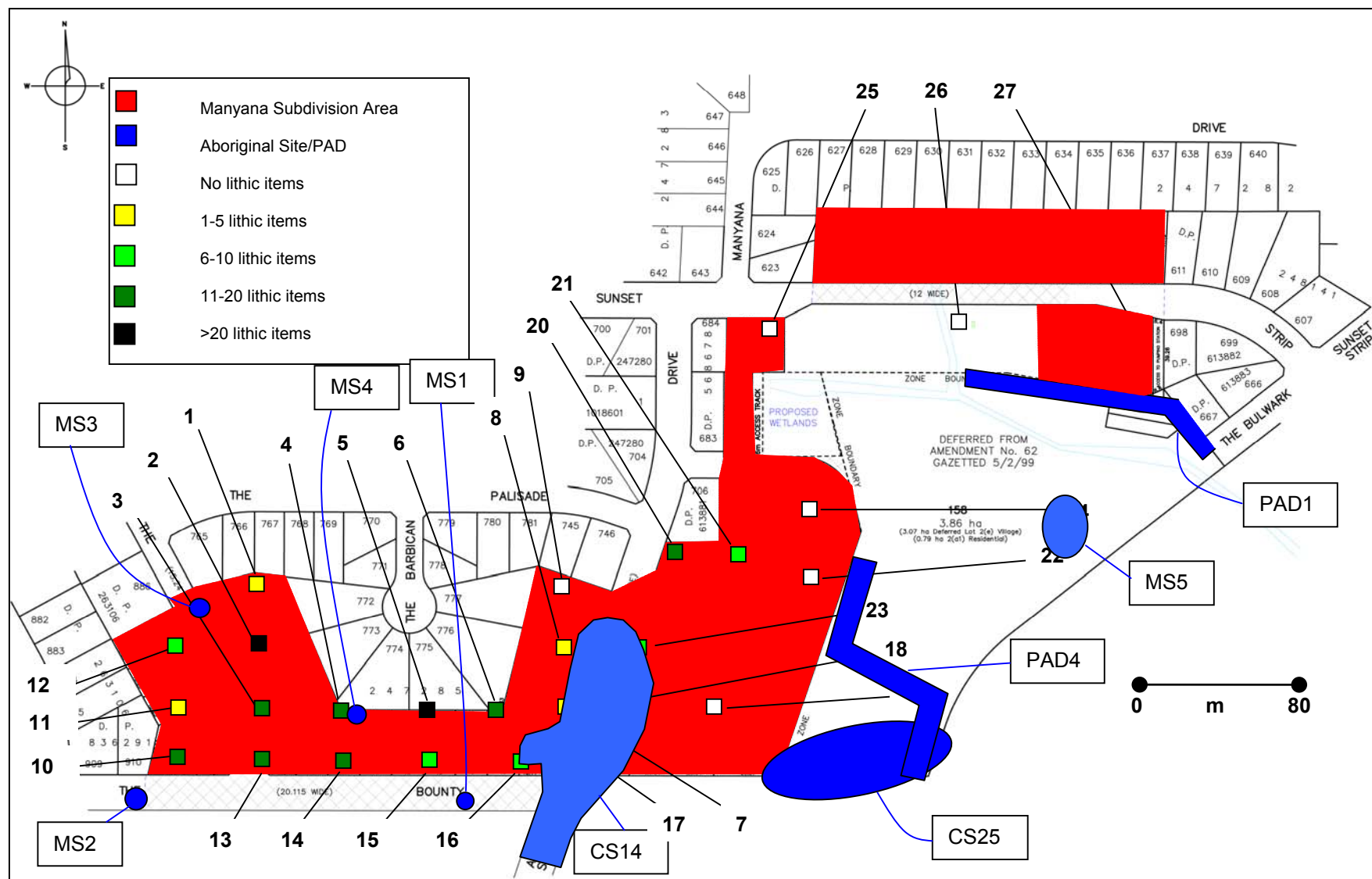


Figure 6.9 Locations of pits relative to previous recordings and numbers of lithic items retrieved from pits (base plan supplied by Watkinson Apperley)



6.7 Vertical and Horizontal Artefact Distribution

The spit profiles from the test pits show a similar trend in that the majority of artefacts were recovered from the upper levels of the deposits, usually the upper three spits. More precisely, the majority of artefacts were found approximately 30 cm below the surface in Spit 2, however, artefacts were also found as far as 100 cm below the surface.

The vertical distribution of artefacts is shown in Figure 6.10. The figure provides the numbers of artefacts recovered from each spit for each pit, and shows that while the peak in artefact numbers occurs in Spit 2 in most pits, some pits show peak artefact discard in Spit 3 (e.g. Pits 2, 8, 10, 13 and 20). This may reflect variation in the actual depth of spits, or alternatively, the depth at which artefacts are buried below surface may vary.

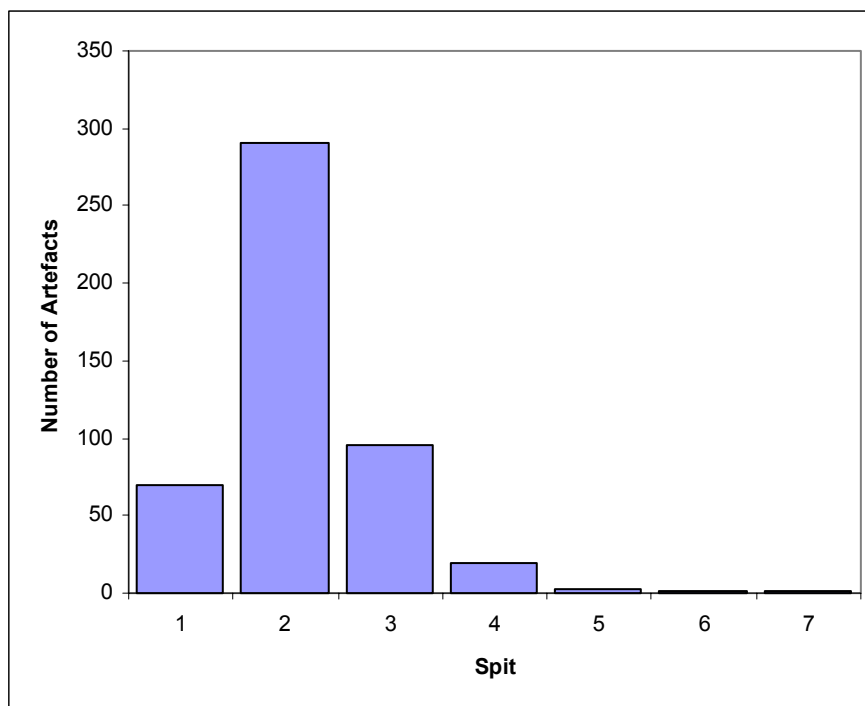


Figure 6.10 Number of artefacts found in each spit

Test Pit	Spit						Totals	
	1	2	3	4	5	6	No.	%
1					1		1	0.2
2	3		40	1			44	9.2
3	6	2	1	5			14	2.9
4	7	4				1	12	2.5
5	14	36	6		1		57	11.9
6	20						20	4.2
7	1						1	0.2
8			2	2			4	0.8
10			3	12			15	3.1
11	1						1	0.2
12		5	1				6	1.3



Test Pit	Spit						Totals	
	1	2	3	4	5	6	No.	%
13		1	16				17	3.5
14		17	3				20	4.2
15	6						6	1.3
16	5	3					8	1.7
17	2	207	5				214	44.7
18	3	1					4	0.8
20		3	15				18	3.6
21	1	7	1				9	1.9
23	2	3	2				7	1.5
27		1					1	0.2
Totals	71	290	95	20	2	1	479	100

Table 6.10 Total artefacts found in each spit and test pit at Manyana Subdivision area

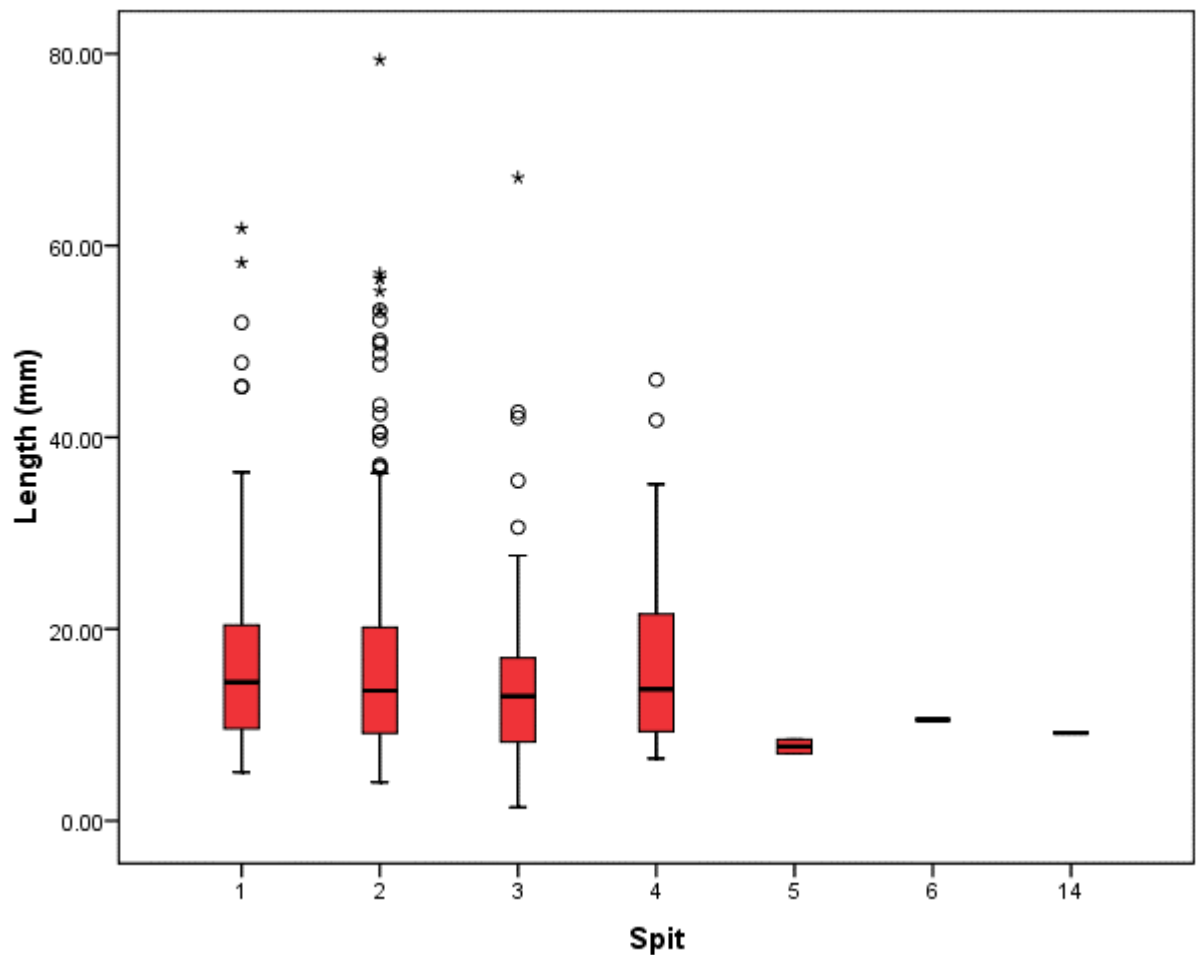


Figure 6.11 Size ranges of artefacts from each spit at Manyana

The presence of size sorting over the depth of a site can sometimes provide an indication of certain site formation processes operating in the past, such as downward movement of artefacts in sandy soils as a result of trampling or bioturbation, or the lifting of heavier of



artefacts as a result of European forest clearance. As can be seen from Figure 6.11, there is no evidence of size sorting at the site that cannot be explained simply by sample size. That is, a larger range of artefact sizes occurs in the top three spits because these three spits contain the largest number of artefacts, and hence rarer, larger artefacts only appear in the larger assemblages found in Spits 1 to 3. The position of the mid-spread (the shaded box) and median (the line in the middle of the shaded box) for each spit does not change appreciably over the depth of the site, meaning that artefact size ranges do not change significantly with depth. The vertical position of the assemblage may therefore be relatively intact.

Spatial Distribution of the Assemblage

Considerable variability exists in the number of stone artefacts recovered from each excavation square (Figure 6.12).

The largest assemblage (N=214) comes from Pit 17, within the large area originally identified as CS14, situated on gently sloping upper spur slopes.

The second highest artefact recovery comes from Pit 5, from the area identified as MS4, sitting on gently sloping north facing lower slopes on the main spurline of the Manyana - Cunjurong Point.

Only two artefacts were found on the surface in an exposure on a track during the surface survey, as dense grass prevented visual inspection of the ground surface. Pit 2 contains the third highest artefact numbers, and is located within the area designated MS3, sitting on the same north facing lower slope as MS3.

Artefact numbers then halve in Pits 6, 14.

High artefact numbers appear to form a roughly east to west band running through the study area from Pit 2, to Pit 5 and down to Pit 17.

Nearby pits (3, 10, 13, 14 and 6) also have higher than average artefact numbers. This band of higher artefact numbers perhaps represents a zone of higher occupational intensity on the gently sloping lower slopes on the on the main the Manyana - Cunjurong Point spurline.

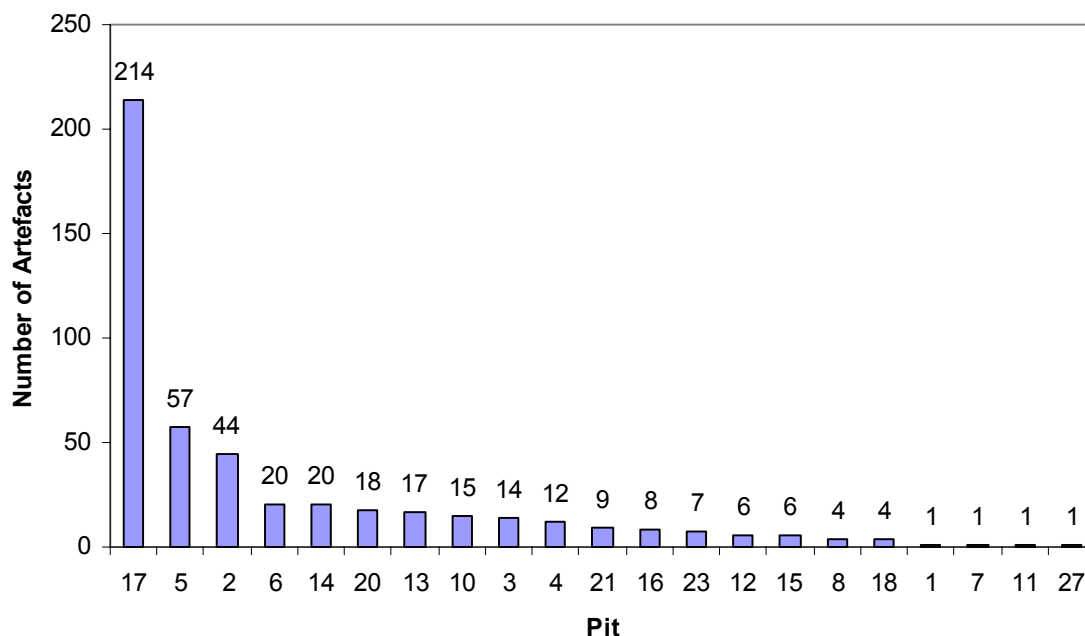


Figure 6.12 Number of artefacts recovered from each excavation pit at Manyana



6.8 Assemblage Richness

It is possible to examine the richness of the Manyana assemblage by plotting the number of assemblage elements found at the site against the number of artefacts recovered for that assemblage. The steepness of the slope indicates the richness of each assemblage.

The Manyana assemblages shows a power curve relationship between assemblage size per pit and the number of assemblage elements present in each pit (Figure 6.13). This means that the diversity of technological and typological forms found in each pit is largely determined by the size of the recovered assemblage; however, the nature of those types may vary according to spatial differences in site use.

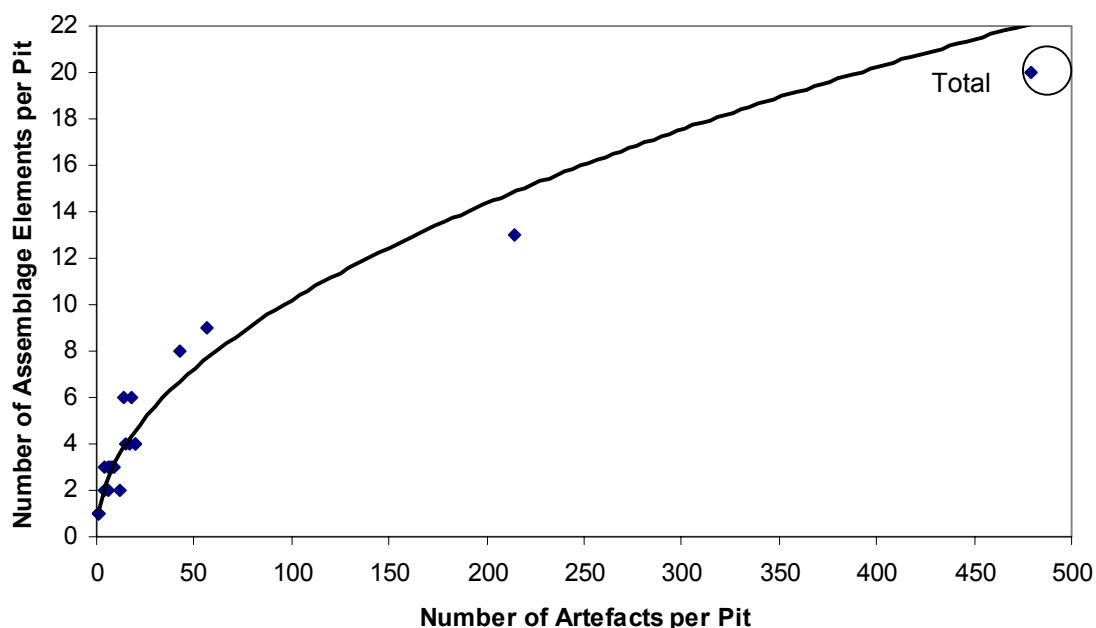


Figure 6.13 Scatter plot showing assemblage 'richness' or the relationship between assemblage diversity (number of classes) of excavated assemblages for Manyana

Comparison with Adjacent Conjola Regional Sewerage Assemblage and Regional Context

Another way of examining the Manyana assemblage is to compare the richness of the Manyana assemblage on a regional context. As above, this is achieved by plotting assemblage size for each site against the diversity of assemblage elements recovered from that assemblage. This allows us to determine whether sites are more or less diverse for a given assemblage size.

Rich sites likely reflect a greater range of activities conducted at a site (technological, functional or social/ceremonial), and this in turn might be seen as a useful measure of the complexity and occupational intensity of sites, and this is also worth considering in determining the significance of sites for cultural heritage purposes. Rich sites might be argued to represent a greater range of activities (technological, functional or social/ceremonial) conducted at a site, and this in turn might be seen as a useful measure of the complexity and occupational intensity of sites as well as a factor worth considering in ascribing significance to sites for cultural heritage purposes.

Since numerous sites have now been analysed by Navin Officer Heritage Consultants using the same methods, it is possible to compare assemblage richness across a broad area (from



southern coastal NSW, north to Sydney and inland to the ACT), and to rank sites according to regional richness.

Figure 6.14 compares the richness of the Manyana assemblage sites in comparison with 21 other coastal sites from NSW and southeast QLD analysed using the same classificatory techniques. A line of best fit has been added to this point cloud to help determine richer (sites sitting above the line) versus poorer (sites sitting below the line) assemblages. It can be seen from Figure 6.16 that the Manyana assemblage is slightly less rich than the average East Coast site. This likely reflects a limited range of activities conducted at the site compared to others that have been examined in coastal environments.

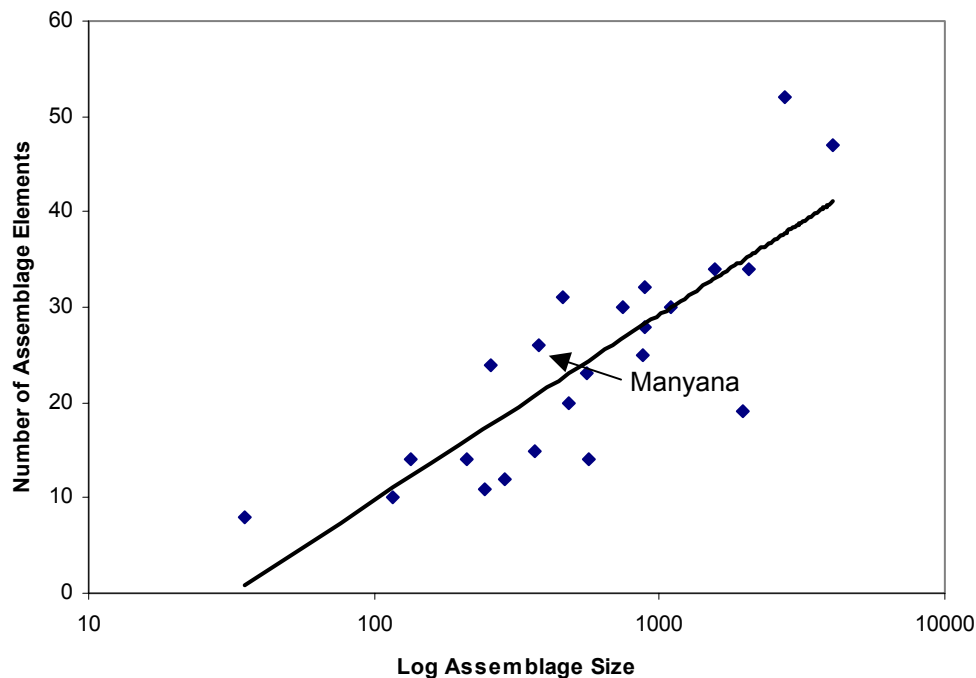


Figure 6.14 Scatter plot of the relationship between the number of assemblage elements present in sites versus (log) assemblage size. The Manyana assemblage is compared to twenty one other coastal sites from the Australian East Coast that have been analysed using the same classificatory techniques.

This apparent low assemblage richness is made even more apparent when raw material diversity is examined. Figure 6.15 plots the same kind of relationship between assemblage size and the number of different raw material types found in the assemblage for the twenty one coastal sites. The Manyana assemblage has the lowest raw material richness of the East Coast sites examined. This may simply reflect the close proximity of silcrete sources to the site, and hence the near total reliance on this local raw material.

Low raw material richness is probably to be expected at many of these sites where local silcrete sources mean the importation of other raw materials was not essential. This can be seen from a plot of the raw material proportions found in sites organised from north to south, from Wollongong to Tuross (Figure 6.16). Sites 58-2-241, CS20 and CS25 excavated during the Conjola Regional Sewerage salvage project and adjacent to the Manyana study area show a complete use of silcrete. whereas sites to the north (Site CS6) and south (sites CS4 and CS26) of the Manyana study area show a greater variety of raw materials.

This probably reflects the availability of silcrete and the lack of other raw materials in the area. Interestingly, other broad raw material provinces are also apparent, with chert increasing in frequency to the north and felsite/rhyolite/andesite increasing in frequency to the south. These



sites, located close to raw material sources for example Sandon Point and Lake Coila, show much higher raw material richness.

The low diversity of the Manyana assemblage suggests that the nature of activities and mobility to and from the site (as a means of introducing exotic raw materials) may have been far more constrained in comparison to similar headland sites to the north. This seems to point to the Manyana area not having served as a nexus for human behaviour in the same way that other sites in similar headland positions have. The open beach aspect, exposure to wind and/or nearby swamps may be one reason for this.

While the site is located near the mouth of Lake Conjola, the position may not have been close enough to the lake to exploit the wider range of resources available there that might give rise to a more complex assemblage. Such speculation can only be confirmed by detailed regional spatial and assemblage analysis that is beyond the scope of the report. Nevertheless, the low assemblage and raw material richness and the near-absence of cores points to a different set of site formation conditions inhering at this site to others previously investigated to the north and south which exhibit much higher assemblage and raw material richness.

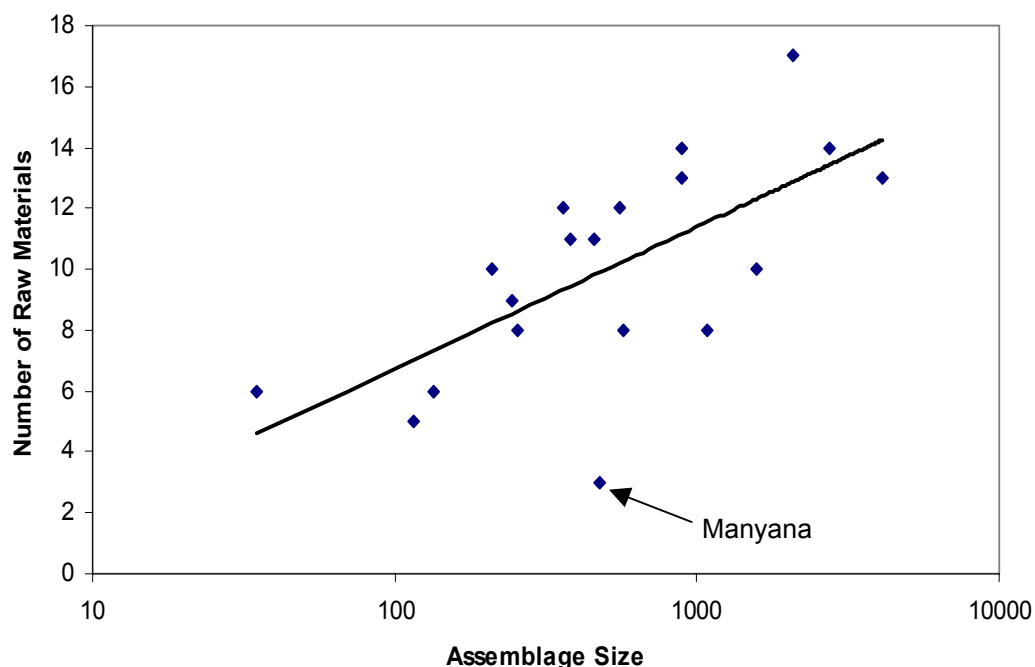


Figure 6.15 Scatter plot of the relationship between the number of raw material types present in assemblages versus assemblage size for NSW South Coast sites analysed using the same methods.

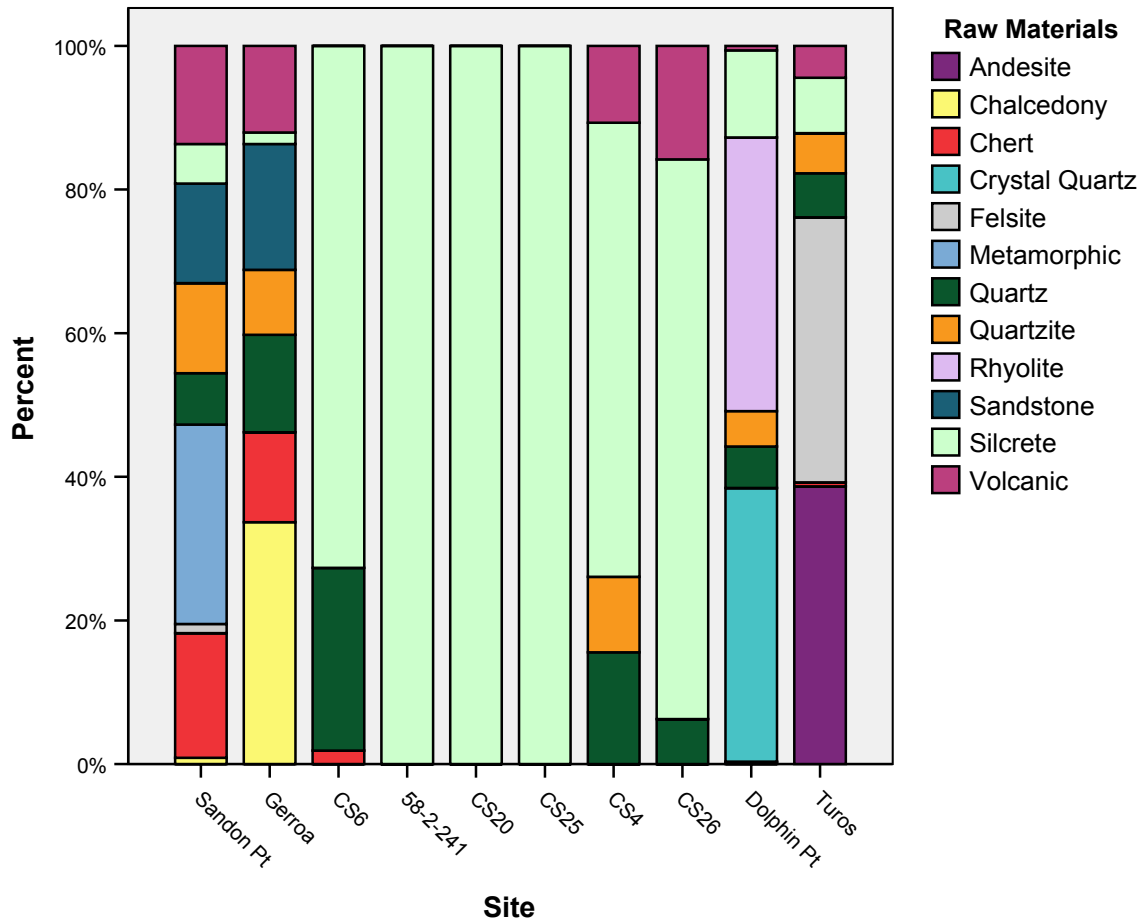


Figure 6.16 Raw material frequencies of other southern NSW coastal sites arranged north to south (left to right) of the Manyana study area

6.9 Summary of Results and Site Significance

The Manyana Subdivision subsurface testing program has collected detailed information on 479 stone artefacts with the potential to inform on local and regional landuse and lithic technology. The Manyana assemblage has lower than average assemblage richness in a comparative study of twenty one East Coast sites, and also has the lowest raw material richness of any in the sample. The assemblage represents an almost exclusive use of locally available silcrete, comparable to sites situated adjacent to the current study area.

The assemblage is highly fragmented however edge damage is rare and is mostly concentrated around areas with large assemblages where trampling damage is likely. Heat fracture is also common at the site and was probably one of the causes of the high rates of artefact fracture. The assemblage shows very little cortex, careful preparation of platforms and mostly small squat flakes. Cores are very rare. This is quite unlike typical assemblages found close to large raw material sources, where many large cores and high rates of cortex are typically found. Coupled with low technological diversity, this site is somewhat unusual in these respects.

A range of manufacturing activities are present at Manyana, and there is evidence for spatial variability in the representation of flaking, retouching and heating of artefacts.

The largest number of stone artefacts was recovered from Pits 17, 5 and 2. Other pits nearby to these also have some of the largest assemblages, suggesting a zone of high artefact discard was concentrated on the gently sloping north facing lower slopes on the main spurline



of the Manyana - Cunjurong Point. The majority of excavation pits returned only small numbers of artefacts.

Generally the artefacts were recovered from the top three spits of the excavations, and the largest peak in artefacts occurred around 30 cm below the surface in most pits. There is no evidence of size sorting of artefacts over the depth of the site and it is suggestive that the cultural stratigraphy of the site may well be intact. The more elevated slopes typically displayed varying degrees of truncation and erosion.

No evidence of cultural features such as hearths, pits, and lenses of shell or other cultural organic material was detected as a result of the testing program.

No potentially datable material, relative to the cultural occupation of the area, was encountered in the test excavations.

Most of the test pits would be rated as having relatively low areal incidence but three test locations have at least some areas of medium incidence.

The site characteristics across the study area revealed by these test excavations are an open-air, variously low to moderate density subsurface cultural deposit of lithic artefacts. The human activities carried out in the Manyana Subdivision test excavation area, identifiable by direct evidence, are stone knapping, flaking, retouching and heating of artefacts.

Open sites displaying evidence of microlith manufacturing are the most common site type within southeastern Australia. Many such sites in coastal environments are also associated with the exploitation of coastal resources, as is the case at Currarong. This site type is common on the NSW southern coast.

The site overall is assessed as low local scientific significance.



7. CONCLUSIONS AND RECOMMENDATIONS

Overall the Manyana site assemblage shows low richness, a limited range of technological activities, core manufacture is under-represented, and the assemblage is highly fragmented. This renders the assemblages of lower information potential than other sites located in similar coastal environments to the north and south. This may reflect local environmental factors that made the site undesirable as a major camping place. The range of activities represented, and the dominance of silcrete, might suggest ephemeral occupation with limited onsite reduction and implement manufacture.

Previously recorded sites MS5, CS25 and PADs 1 and 4 are now included in environment protection zones. Previously recorded Aboriginal sites MS1, MS2, MS3, MS4 and CS14 that occur within, or very close to, the Manyana study area will be variously impacted by the proposed subdivision. Archaeological material has now also been identified as occurring in varying densities across most of the Manyana study area.

The archaeological deposits are likely to extent beyond the area of the proposed development footprint (south along the proposed Manyana Drive- Austen Street) resulting in preservation of site CS14 and subsurface deposits.

The majority of the test sites with artefacts revealed deposits with a sporadic distribution of low density archaeological material and some evidence of stratigraphic integrity. These contexts displayed varying degrees of disturbance, especially within the top 15 cm (spit one). Although an argument can be put forward which postulates that low density archaeological material may have research value, such potential is moderated by the degree of surrounding urban development and the presence of many other similar, or better, sites in the region.

The artefactual material present was generally of low or low moderate density and showed a limited range of activities. Further salvage of artefacts using controlled archaeological methodologies is not considered to be warranted or cost-effective, based on scientific objectives. It is considered unlikely that a further program of archaeological investigation in these areas would significantly increase our understanding of the activities and distribution of artefacts across the development footprint area.

Based on the archaeological assessments provided in this report, the deposits of low archaeological significance are not considered to pose a constraint to the proposed development of the Manyana Subdivision area.

It is recommended that:

1. No further archaeological investigation is required within the proposed Manyana subdivision development area.
2. As the Manyana development is being conducted under Part 3A of the *Environmental Planning & Assessment Act (1979)*, this removes need for single-issue approvals under the *National Parks and Wildlife Act (1974)* and the development may proceed without gaining an Aboriginal Heritage Impact Permit (s90 Consent to Destroy) from the Department of Environment and Climate Change.
3. One copy of this report should be provided to each of the registered Aboriginal stakeholder groups.



4. Three copies of the final report should be forwarded to the NSW DECC at the following address:

Cultural Heritage Officer
EPIRD
NSW Department of Environment and Climate Change
PO Box 2115
QUEANBEYAN NSW 2620



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