

APPENDIX 4

QUARRIES, STONE FEATURES AND MODIFIED TREES

SITES IDENTIFIED DURING THE fieldwork program were classified in accordance with categories used by the Department of Aboriginal Affairs in registering sites under the *Aboriginal Heritage Act 1972* (WA), as well as standard practice in compliance archaeology in the region and elsewhere in Australia (e.g. Burke and Smith 2004, 202ff.). The following site types typical of the inland Pilbara occur in the study area: surface artefact scatter, reduction area, quarry, rockshelter, modified tree and structure. Rock art is absent from the area, probably because the available banded iron formation rock surfaces are not suitable for the execution or survival of pigment or engraved art. This appendix provides supplementary information about quarries, stone features and scarred trees recorded in the study area, which are not discussed in detail in Chapters 4 to 6.

QUARRIES

Quarries are defined as locations where stone used to manufacture flaked or ground stone artefacts was extracted. Archae-aus field teams recorded 27 quarry sites (Table A4.1). All occur along the escarpment or in the ranges nearby (Figure A4.1) and five different raw materials were exploited. Most were BIF (44%) or chert (37%), including one site (CB09-259) where both

raw materials occurred. The rest were chalcedony (three sites), mudstone (one) and basalt (one). BIF, chert, chalcedony and perhaps mudstone occur in strata belonging to the Marra Mamba Formation. Basalt, chert and mudstone are found in Jeerinah Formation strata (see Chapter 3, Figure 3.4).

Most quarry sites occurred at highly weathered and mostly fractured ground surface exposures of bedrock (see Chapter 3, Figure 3.5). Chert bands were exposed in shelter walls (CB09-260 and CB09-266) or beneath shallow overhangs (CB09-240). Several sites had multiple quarried exposures and several were also part of multi-component sites or site complexes (for example, see Chapter 5, Figure 5.6).

Quarries are variable in size in terms of both area (range 4–11,445 m²; mean 2422±3125) and artefact numbers (estimated artefact population range 28–2000, mean 468±547). Generally, however, area is small with 50% less than 2000 m². Artefact density is also high; maximum artefact density per m² ranges from 0.2 to 304 with a mean of 45±87, although 55% are less than 5/m². BIF quarries tend to be larger in area than chert. (Figure A4.2, Table A4.1). Nevertheless, t-tests suggest that the difference in mean area is not statistically significant ($t=-0.99051$, $p=0.334$). Quarry assemblages commonly consist of complete flakes and flake fragments. Formal tools and grinding material are rare.

In the rich lithic landscape of the study area, quarry sites are difficult to distinguish from other types of sites with artefacts and indeed often occur in association with them. Conversely, many small surface artefact scatters and reduction areas also probably indicate extraction of raw material, in the form of isolated cobbles and boulders encountered in the course of movement across the plains. In the study area, most of these low-density, small extraction sites probably also represent opportunistic encounters with raw material sources occurring as outcrops or seams in the ranges.

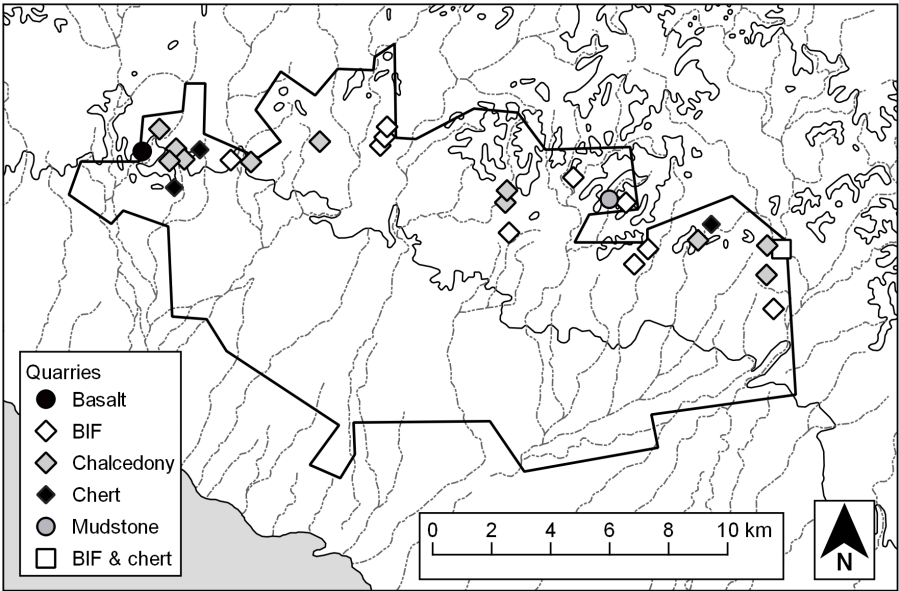


FIGURE A4.1: Distribution and type of raw material for quarries in the study area.

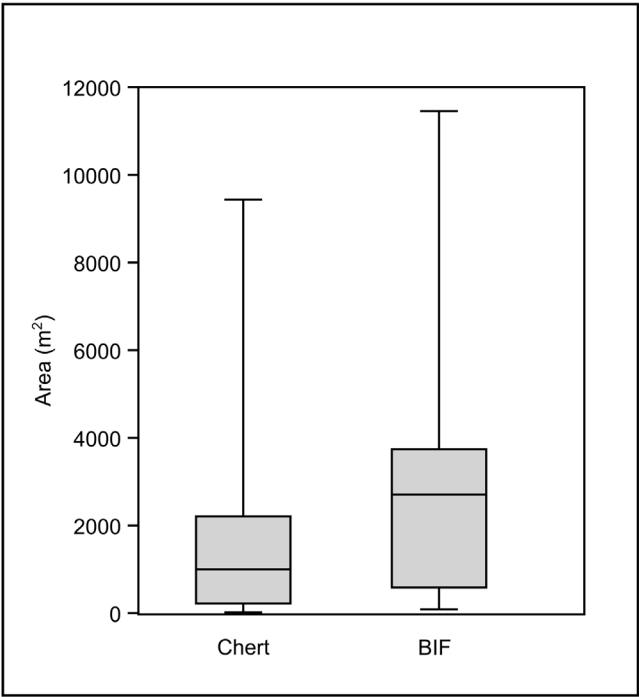


FIGURE A4.2: Comparison of area for BIF and chert quarries.

TABLE A4.1: Quarry sites recorded in the study area.

SITE NUMBER	Raw material	Area of site (m ²)	Area of outcrop (m ²)	Estimated maximum N of artefacts	Artefact density: range (N/m ²)	Artefact density: median (N/m ²)	Comments
CB08-082	Chalcedony	7793	Not mapped	2000	0.48–21	0.5	surface outcrop
CB08-083	Chert	659	Not mapped	600	0.08–304		surface outcrop tula recorded
CB08-088	Chert	2211	7.5	500	6–19		surface outcrop
CB08-092	Chert	9435	0.5	1000	0.56–60	0.8–20	surface outcrop no cortex recorded on artefacts
CB08-110	Chert	1811	75	600	0.4–34	0.44	surface outcrop 1 retouched piece; 1 dolerite manuport
CB08-128	BIF	11,455	64/200	300	0.04–0.24	0.16	two distinct quarried outcrops; other raw materials appear in small numbers
CB08-239	Basalt	4366	2500	70	0.2–1	0.32	surface outcrop 2 retouched pieces; 1 dolerite muller; 7 dolerite manuports
CB08-501	Chert	220	16	60	0.88		surface outcrop
CB08-522	BIF	3740	Not mapped	400	1.32–1.64		surface outcrop 1 retouched piece
CB09-061	BIF	2942	192	120	0.16–0.48	0.28	surface outcrop small number of chert and basalt flakes
CB09-106	Chert	286	30	200	0.32–1.16	0.76	surface outcrop
CB09-239	Chert	3468	27 (largest of 6)	270	1–240	1.75	six surface outcrop
CB09-240	Chert	1000	Not mapped	550	0.5–4	30	two distinct source areas: seam in rock face under overhang and surface outcrop one retouched piece; one BIF flake

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CB08-082	Chalcedony	7793	Not mapped	2000	0.48–21	0.5	surface outcrop
CB08-083	Chert	659	Not mapped	600	0.08–304		surface outcrop tula recorded
CB08-088	Chert	2211	7.5	500	6–19		surface outcrop
CB08-092	Chert	9435	0.5	1000	0.56–60	0.8–20	surface outcrop no cortex recorded on artefacts
CB08-110	Chert	1811	75	600	0.4–34	0.44	surface outcrop 1 retouched piece; 1 dolerite manuport
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CB09-239	Chert	3468	27 (largest of 6)	270	1–240	1.75	six surface outcrop
CB09-240	Chert	1000	Not mapped	550	0.5–4	30	two distinct source areas: seam in rock face under overhang and surface outcrop one retouched piece; one BIF flake

STONE FEATURES

‘Man-made structure’ is a term used by DAA that refers to arrangements, groupings or piles of rocks, or tree branches, relating to economic or ceremonial practices. This site type includes several types of features including ceremonial arrangements of stones, fish traps, the remains of huts, hunting hides, cairns, walls and so-called walled niches. Structures occur quite widely in the Pilbara region but have been little studied. There is no well-recognised classification and, in some cases, it can be difficult to distinguish human-made features from natural features. While some structures can be interpreted in terms of function, others are enigmatic. Records of various types of stone structures are scattered throughout grey literature from the Pilbara, but there has been little investigation of them. Most are difficult to date because they lack association with datable cultural material. Published research on stone structures associated with rockshelters in the inland Pilbara is rare (Bindon and Lofgren 1982; Wallis and Matthews 2016). Stone arrangements documented as ceremonial sites are also known in the region (Palmer 1977) and other known sites also fall into this category. The best-known stone arrangements of this type are in the Packsaddle area in the Hamersley Range (Hook and Di Lello 2010).

Twenty-two stone features were recorded at 18 sites in the study area (Table A4.2). All but one were located in the Chichester Range (see Chapter 5, Figure 5.1). CB09-66 occurred on the stony hardpan plains near the range’s escarpment. Most were stone structures associated with rockshelters. Some enigmatic features also exist that are certainly not cultural. These are not discussed further here.

Analysis showed that the stone features positively identified as cultural fell into five categories, based on form: stone arrangements, cairns, walled enclosures, niches and stone caches. Most were walled enclosures and most formed part of multi-component sites.

A few stone features were investigated to discover the presence of cultural remains. This involved removing stones that comprised the feature’s wall at four walled enclosures (CB08-509, CB10-89, CB10-91 and CB11-93) and at two niches (CB09-264 and CB11-108). The results are discussed below with reference to each feature.

STONE ARRANGEMENTS

The two stone arrangements were found on hilltops. CB08-103 (see Chapter 5, Figure 5.7(b); Table A4.2a) is a linear pile of local stone measuring eight metres long, three metres across and 50 cm high. A two-chambered rockshelter (see niche discussion below) and a large, flaked-stone artefact scatter are located nearby downslope (Figure 5.8).

CB08-239 (Figure 5.5a) consists of four dolerite river pebbles placed separate from one another forming a roughly linear formation. The arrangement is one component of a site complex that includes a basalt quarry, a two-chambered rockshelter and a large stone artefact scatter, which includes a millstone fragment and manuports as well as flaked stone.

CAIRNS

Three stone cairns were found at rockshelters CB09-250, CB09-254 and CB12-166. Each was positioned toward the front and centre of the shelter. These features consisted of stone slabs collected from the nearby rock face. All were constructed by haphazardly placing one stone atop another to a height of no more than 40 cm (Table A4.2b). Other cultural remains were only recorded at CB09-254, where there was a surface assemblage of four BIF flakes, one with retouch.

CB09-250 (Figure 5.5b) is located adjacent to an excavated rockshelter CB09-249, which dates to the early-mid Holocene and to the last 1000 years (Appendix 2). The CB09-254 rockshelter is situated near another unexcavated shelter, CB09-255, that has two walled enclosures (see discussion below). CB12-166 is closest to CB12-162, a small chert artefact scatter.

WALLED ENCLOSURES

Walled enclosures are rock chambers that have one or more openings at least partially blocked by a dry-stone wall. They comprise the most common type of stone feature found in the study area. Eight were recorded and all occur at either large, isolated bedrock exposures or along rocky slopes bordering drainage lines (Table A4.2c). The associated natural cavities vary greatly in size, from one to 16 square metres.

TABLE A4.2: Stone features.

A. STONE ARRANGEMENT					
<i>Site number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB08-103	arrangement of piled stones	linear	hilltop	no data	none
CB08-239	arrangement of individual stones	roughly linear	hilltop	4	flaked stone artefacts; manuports
B. STONE CAIRN					
<i>Site Number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB09-250	stacked stones	irregular	rockshelter	4	none
CB09-254	stacked stones	irregular	front of rockshelter	17	4 flakes in nearby shelter
CB12-166	stacked stones	irregular	rockshelter	8	none

TABLE A4.2: *Continued.*

A. STONE ARRANGEMENT				
Site number	Feature measurements			Comments
CB08-103	8 m E–W (long)	3 m N–S (wide)	50 cm high	locally available stone of varying size up to 40 cm
CB08-239	about 6 m long	negligible	negligible	two other similar stones located adjacent
B. STONE CAIRN				
Site Number	Feature measurements			Comments
CB09-250	1 m wide	90 cm deep	40 cm high (est.)	
CB09-254	85 cm wide	about 50 cm deep	35 cm high	also, 3 alcoves along back wall (no other data)
CB12-166	90 cm wide	85 cm deep	30 cm high	large tabular BIF stones inside dripline and near centre of shelter floor and not associated with walled enclosures (see below)

TABLE A4.2: *Continued.*

C. WALLED ENCLOSURE					
<i>Site Number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB08-509	single wall	irregular	base of gully wall (northern slope)	26	none
		no wall			
CB08-513	single wall	irregular	base of BIF isolate	6	none
		no wall			
CB09-255	multiple walls	irregular	base of BIF isolate	6	none noted
		irregular		5	none noted
		no wall			
CB10-42	single wall	irregular	base of low BIF isolate	17	none

TABLE A4.2: *Continued.*

C. WALLED ENCLOSURE				
<i>Site Number</i>	<i>Feature measurements [typically taken from plans]</i>			<i>Comments</i>
CB08-509	75 cm wide	depth into rock face (not measured)	60 cm high	two openings connected with one almost completely blocked (measured) measurements not recorded
	?	?	?	
CB08-513	100 cm wide	?	40 cm high	two openings connected with one completely blocked (measured) and the other (1 m high, 1 m wide); alcove 10 m
	100 cm wide		100 cm high	
CB09-255	50 cm wide	depth not recorded	30 high	cavity inside BIF isolate about 4 m wide; 3 openings with 2 having walls
	50 cm wide	depth not recorded	25 cm	
	opening 100 cm wide	depth not recorded	opening 75 cm high	
CB10-42	300 cm wide	20 cm deep (est.)	75 cm high	single opening; cavity 12 m deep

TABLE A4.2: *Continued.*

C. WALLED ENCLOSURE					
<i>Site Number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB10-89	single wall	irregular	rock face of gully slope ~5 m above ground level	2	none
		no wall –measurements for opening recorded			
CB10-91	single wall	irregular	base of BIF isolate	11	nil
		single stone blocking up a vertical cavity			
CB11-93	single wall	irregular	W slope of gully, near base	30	none
CB12-180	single wall	irregular	BIF isolate situated along a gully slope	25	none

TABLE A4.2: *Continued.*

C. WALLED ENCLOSURE				
<i>Site Number</i>	<i>Feature measurements [typically taken from plans]</i>			<i>Comments</i>
CB10-89	120 cm wide	100 cm deep	80 cm high	two entrances into single chamber which is 4 m deep, 50 cm wide, 50 cm high.
	100 cm wide	depth n/a	90 cm high	Also, an alcove measuring 80 cm wide, 230 cm deep and 30 cm high, which has no wall but contains two leg bones (macropod); cultural association uncertain.
CB10-91	250 cm wide	80 cm deep	60 cm high	wall mostly demolished; two portions remain roughly separated by about 50 cm in the middle of the opening chamber 2.1 m wide, 1.1 m high & 2.5 m deep; unsure if the two openings are linked to one another, or perhaps not
	40 cm wide	? depth	40 cm deep	uncertain if this feature is part of the walled enclosure. Also, feature may be natural as the stones noted inside may have collapsed inside.
CB11-93	115 cm & 120 cm wide	90 cm deep	75 cm high	wall mostly demolished; two portions remain and measurements include both; enclosure 4.3 m wide, 1 m high & 4.5 m deep
CB12-180	180 cm wide (what remains of the wall)	750 cm deep	185 cm high	wall partially demolished; enclosure 8.5 m deep, 1.2 m high

TABLE A4.2: *Continued.*

D. NICHE					
<i>Site Number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB08-103	ground level	natural rock fissure	toward back of shelter	no info	hammerstone and cores
	ground level	natural rock fissure	toward back of shelter	no info	
CB09-264	high	natural rock fissure	shelter wall inside dripline	about 17	none
CB11-108	ground level	natural rock fissure	shelter wall inside dripline	16	2 flakes and single platform core on shelter floor
CB11-153	high	natural rock fissure	shelter wall inside dripline	1	2 flakes on shelter floor
E. STONE CACHE					
<i>Site Number</i>	<i>Type</i>	<i>Form</i>	<i>Position</i>	<i># stones</i>	<i>Cultural material</i>
CB09-66	pebble mound	dispersed heaps	silt and gravel plain	~300	artefact scatter in association
				~400	
				~500	
				?	2 flakes on enclosure floor
CB09-73	pebble mound	two dispersed heaps	silt and gravel plain	500–1000	artefact scatter in association

TABLE A4.2: *Continued.*

D. NICHE				
<i>Site Number</i>	<i>Measurements</i>			<i>Comments</i>
CB08-103	no data	no data	no data	two separate openings into the rock face and immediately adjacent; one opening 40 cm wide, other 25 cm (estimates from shelter plan)
	no data	no data	no data	
CB09-264	4.7 m wide	1.9 m deep	25–50 cm high	situated 1.8 m above rock-shelter floor; partially blocked
CB11-108	? 75 cm wide	1 m deep	? 50 cm high	small opening toward back of shelter; behind a collapsed wall – only noticeable as a small opening prior to removal of stones
CB11-153				small opening about 1.5 m above ground level and blocked by a single stone measuring about 40 cm across; hole runs from the exterior wall into the shelter
E. STONE CACHE				
<i>Site Number</i>	<i>Measurements</i>			<i>Comments</i>
CB09-66	230 cm	190 cm	10 cm	4 separate occurrences
	260 cm	180 cm	10	stones sourced locally
	230 cm	200 cm	8 cm	particularly convincing
	220 cm	200 cm	4 cm	
CB09-73	180 cm	150 cm	8 cm	

Those with a single entrance, for example CB10-42, had remnants of walls still in place and a scattering of large stones and boulders immediately adjacent.

Sites with multiple openings, for example CB08-509 (Figure 6.5), exhibited a similar pattern except that one entrance was evidently not walled up. At CB08-509 all 26 stones forming the wall were removed to examine the area of the chamber just inside. No cultural material or deposits were observed. Walled openings were on average about twice as wide as high, but there was considerable variation in their widths, 50–300 cm, and heights, 40–185 cm. No artefactual remains were found in direct association with the walled enclosures. Traditional Owners assisting the Archaeaus field teams thought these sites were used when hunting game (see also Chapter 3).

Walled enclosures are notable in their association with rockshelters. Four (CB10-89, CB10-91, CB11-93 and CB12-180) are adjacent to rockshelters with relatively recent deposits, either as surface remains or excavated material dating to roughly the last thousand years. Two of these rockshelters also have earlier excavated deposits. Two other walled enclosures (CB08-509, CB08-513) lie within a kilometre of CB08-500, whose deposits date to the last 500 years. The two remaining walled enclosures have a cairn (CB09-254) and a manuport resting on a ledge in a gully wall (CB11-110) as their nearest site.

NICHES

Three niche features, CB08-103, CB09-264 and CB11-108, were discovered in the study area. Whereas walled enclosures typically block off the entrance to a sizeable chamber, this category of stone feature has a relatively small, confined opening and occurs in out-of-the-way positions in rockshelters (Table A4.2d). Two niches were recorded at CB08-103, each situated toward the rear wall of a small rockshelter. Both are closed off from the main chamber with small stone walls, neither was investigated nor recorded in any detail. Three artefact scatters, two small and one large, are this site's nearest neighbours.

The niche at CB09-264 (Figure 5.5c) was situated about 180 cm above the shelter floor and consists of stone slabs dispersed along the front of



FIGURE A4.3: Stone caches (a) CB09-66 (b) CB09-73.

a high ledge in groups or as single stones. The ledge is between 25 and 50 cm high and runs for about six metres along the shelter's back wall, about 180 cm above the shelter floor. Eight of the 17 slabs creating the eastern niche were removed to reveal a cavity two metres deep. No cultural deposit or artefacts were present. The site is located 150 m away from CB09-266, a rockshelter whose chert veins were quarried.

CB11-108 is a two-chamber rockshelter located about 1.3 kilometres north of the CB10-40/41 site complex. The niche at the site was located toward the rear of the first chamber. The stone wall at the opening, which has partially collapsed, consisted of 16 stones and measured 75 cm wide and 50 cm high. A very small opening was found in the alcove's back wall that formed a connection into the rockshelter's second chamber. The wall was completely removed to investigate what may lie behind. The area revealed measured about a metre deep and containing no cultural remains. A small artefact scatter was adjacent to the site and a scarred tree was found 200 m away.

STONE CACHES

An unusual feature occurred at CB09-66 and CB09-73 (Figure A4.3). This consists of a localised concentration of unmodified, pebble-sized stones found among flaked stone artefact scatters situated in the open (Table A4.2e). CB09-66 has four features while CB09-73 has only one. The pebbles range between 20 mm and 50 mm in diameter and the concentrations are commonly more than two metres across. Aboriginal informants described these features as caches of stones (McHarg et al. 2009, 144–46, 181–82). CB09-66 was a large site complex consisting of numerous artefact scatters, and CB09-73 was situated 650 metres away.

These stone caches may seem natural and many similar features likely are. Their recognition within an area naturally rich in bedrock exposures can also be difficult. Spinifex ground cover also helps to mask their visibility. However, in both these cases, the areas adjacent are largely clear of pebble or cobble-sized stones. Also, the local geology does not suggest bedrock exposures are eroding within the area. Therefore, human activity seems

plausible and the rare appearance of stone caches reported for the study area may not be an accurate reflection of their true occurrence.

MODIFIED TREES

A modified tree is one which has its trunk and limbs modified by the removal of bark and/or wood. Aboriginal people removed wood/bark for material items such as shields and containers, or to access native honey inside hollows in the tree. Modified trees occur widely in Australia and are commonly referred to as 'scarred trees' (see Beesley 1989; Long 2005; McDonald 2005; Pardoe 2003; Rhoads 1992; Windle and Rolfe 2003).

Nineteen modified trees (Table A4.3, Figures A4.5-A4.7) were recorded along or near waterways traversing the stony hardpan plains and hills of the study area (Figure A4.4). All were *Eucalyptus leucophloia* (snappy gum), except for one (CB11-148), which could not be identified to species. Most trees had single scars; two trees had two scars each. The orientation of the scars on the tree trunk varied greatly, although most faced south, south-west and west.

Table A4.4 presents the descriptive statistics for scar dimensions and height of base above the ground. The distribution of height above the ground is skewed; only one-third had a base higher than one metre above the ground. On the whole, scars were three to four times as long as wide with mean length of 58 cm and width of 16 cm. Two scars (CB08-331 and CB09-109) were unusually large (Figure A4.6). This uniformity in bark removal may represent a standardised practice, perhaps most consistent with extraction of bark for making carrying dishes or shields. However, caution is necessary because the sample is small and regrowth was not examined in detail.

Modified trees do not appear to be spatially associated with particular site types. Six of the 19 scarred trees had other sites occurring within 100 metres: two scarred trees, two small artefact scatters, a niche and a medium artefact scatter. None were near a large artefact scatter and small artefact scatters were the most common site type within 500 metres. One modified tree had no other sites within half a kilometre.

TABLE A4.3: Scarred tree attributes.

SITE NAME	Environment	Scar number	Height above ground (cm)	Length (cm)	Width (cm)	L:W	Vegetation code (see Table 3.1)	Comments
CB08-105	gravel plain	1	56	69	10	6.9	7, 6	NW side
CB08-330	hillside	1	98	38	11	3.5	12, 7	double bole tree; facing W
		2	110	50	8	0.6		facing W
CB08-331	gully slope by creek line	1	98	117	34	3.4	16, 13	SW
CB08-430	creek bank	1	100	79	19	4.2	7, 6	W
CB08-512	creek bank	1	18	44	20	2.2	16, 13	SW
CB09-81	creek line	1	100	44	13	3.4	16, 11	W
CB09-98	creek line along base of low hill	1	no data	37.5	11	0.2	7, 6	N
		2	no data	28	11	3.2		W
CB09-109	large creek	1	no data	120	36	4.5	7, 6	N
CB09-265	gully	1	140	17	7	3.7	16, 13	S; honey extraction?
CB10-96	undulating plain	1	25	62.5	19.5	3.3	12, 7	S
CB10-137	hill slope	1	50	61.5	13.6	6.5	12, 7	E
CB10-140	hill slope	1	100	55.6	15	4.3	12, 7	E
CB10-141	creek bank	1	150	36.4	11.2	3.0	12, 7	S
CB11-81	hill slope	1	36	98	15	3.2	12, 7	
CB11-107	creek bank	1	120	56	13	3.1	16, 13	NW
CB11-109	creek bank	1	?	64.5	12.2	3.4	16, 13	S
CB11-147	creek bank	1	116	65	22	2.5	12, 7	S
CB11-148	hilltop	1	200	30	9.5	3.3	12, 7	SE
CB11-175	creek bank	1	40	55	18	5.3	16, 13	SW

TABLE A4.3: Scarred tree attributes.

	MEAN	SD	MEDIAN
Height above ground (cm)	92	11	100
Length (cm)	58	3.2	56
Width (cm)	16	1.1	13

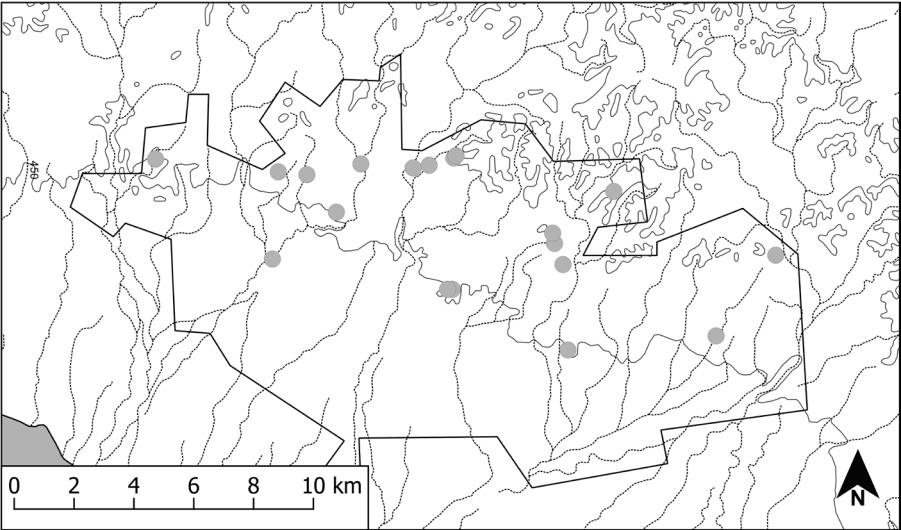


FIGURE A4.4: Distribution of scarred trees in the study area.



FIGURE A4.5: CB10-137: scarred tree.



FIGURE A4.6: CB09-109: scarred tree with unusually large scar.



FIGURE A4.7: CB10-96: scarred tree.