7.4.2.2 Artefact distribution

Horizontal Distribution

Of the 192 artefacts recorded, 62 (32 per cent) came from two clusters: 39 artefacts at Area 2 Tr6 Sq3 and 23 artefacts at Area 4 TR4 Sq2. Otherwise there was no notable distribution pattern to the recorded artefacts.

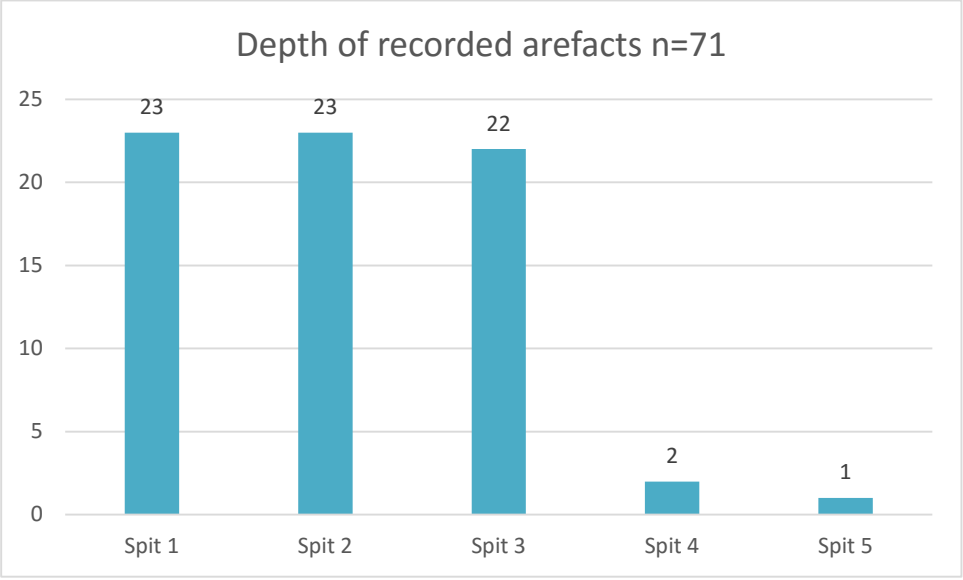
Of these two clusters, one (Area 2) was highly isolated and not part of a more-extensive artefact scatter while the other (Area 4) was not as isolated but still remained a 'hot-spot' when compared with surrounding squares. At Area 2 Tr6 Sq3, three excavation squares were excavated surrounding Sq3: Sq10 five metres north, Sq9 five metres south and Tr9 Sq1 five metres east. None of these surrounding squares recorded any artefacts.

At Area 4 Tr4 Sq2, Tr4 Sq1, located five metres to the northwest recorded no artefacts and Tr4 Sq3, located five metres southeast recorded 11 artefacts while TR4 Sq4 located five metres southeast of Sq2 recorded three artefacts. This shows some distribution of artefacts in this area although further investigation would be required to fully ascertain the extent of the concentration.

Vertical Distribution

83 excavation squares (of the 153 excavated or 54 per cent) were excavated in 5cm spits. Of those excavation squares containing artefacts, almost all came from the top-most 15cm of deposits (spits 1-3) with very few being recorded at depths greater than 15cm (**Figure 7–27**). There is very little differentiation between spits 1-3 and the only conclusion that can be drawn from this vertical distribution is that artefacts, at the areas investigated, are located very close to the surface.

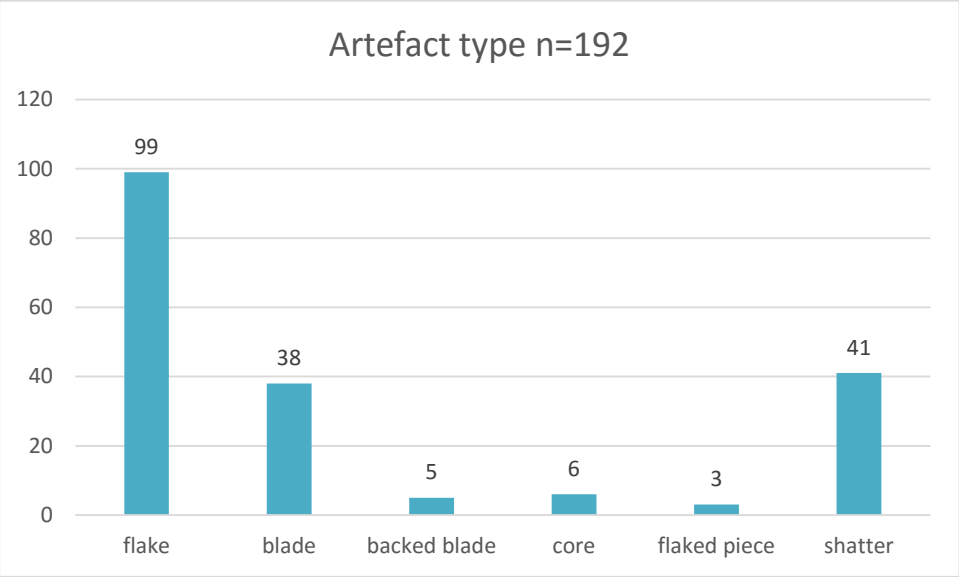
Figure 7-27. Test Excavation. Vertical distribution of artefacts.



7.4.2.3 Artefact types

The most-numerous artefact type is the unmodified flake with 52 per cent of all artefacts being recorded (**Figure 7–28**). The second most-numerous artefact type is 'shatter' defined as chips, chunks, and other undiagnostic pieces of raw material (22 per cent). Blades (20 per cent) are the only other sizeable category with backed blades (three per cent), cores (three per cent) and flaked pieces (defined as flakes which, in turn, have had flakes struck from them (1.5 per cent) making up the remainder of the artefact assemblage.

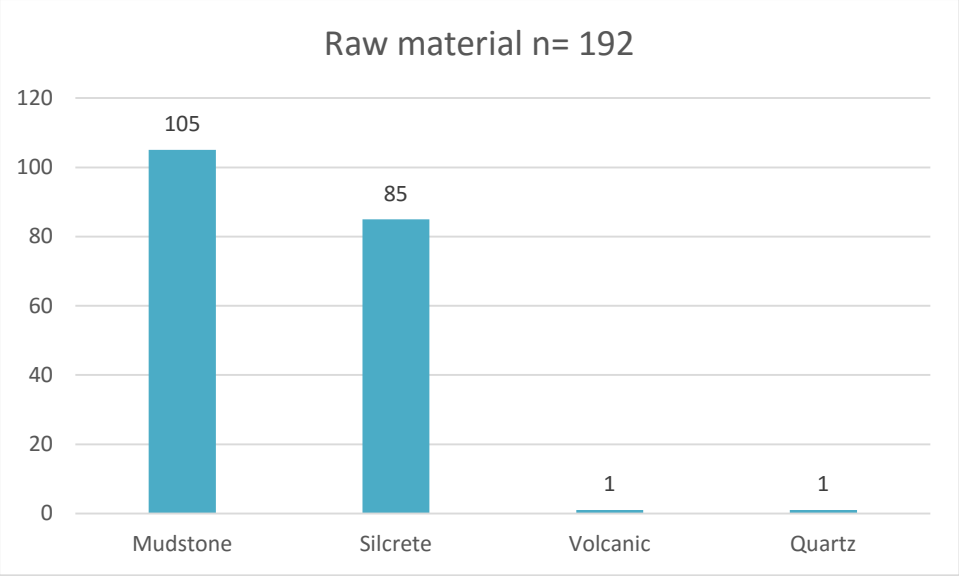
Figure 7-28. Test Excavation. Artefact type.



7.4.2.4 Raw materials

The vast majority of recorded artefacts come from either mudstone or silcrete sources. Very small numbers of artefacts from quartz and volcanic were recorded (**Figure 7–29**). 55 per cent of artefacts were mudstone and 44 per cent were silcrete with negligible numbers from quartz and volcanic sources.

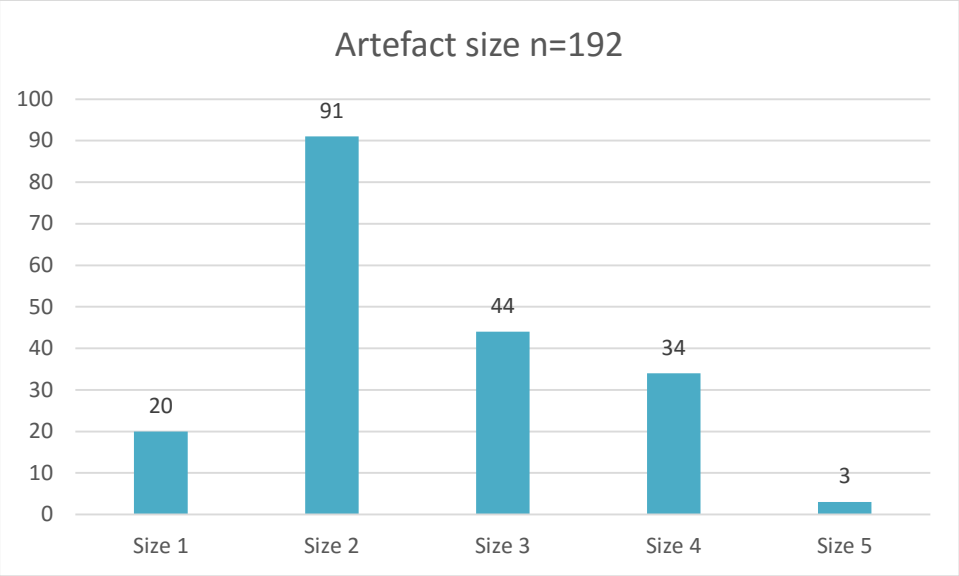
Figure 7-29. Test Excavation. Artefact raw materials.



7.4.2.5 Artefact size

The most numerous size category of recorded artefacts is category 2 (10-20mm) with 47 per cent of all artefacts (**Figure 7–30**). 23 per cent are size category 3 (20-30mm), 18 per cent are size category 4 (30-50mm), 10 per cent are size category 1 (0-10mm) and less than two per cent are larger than 50mm.

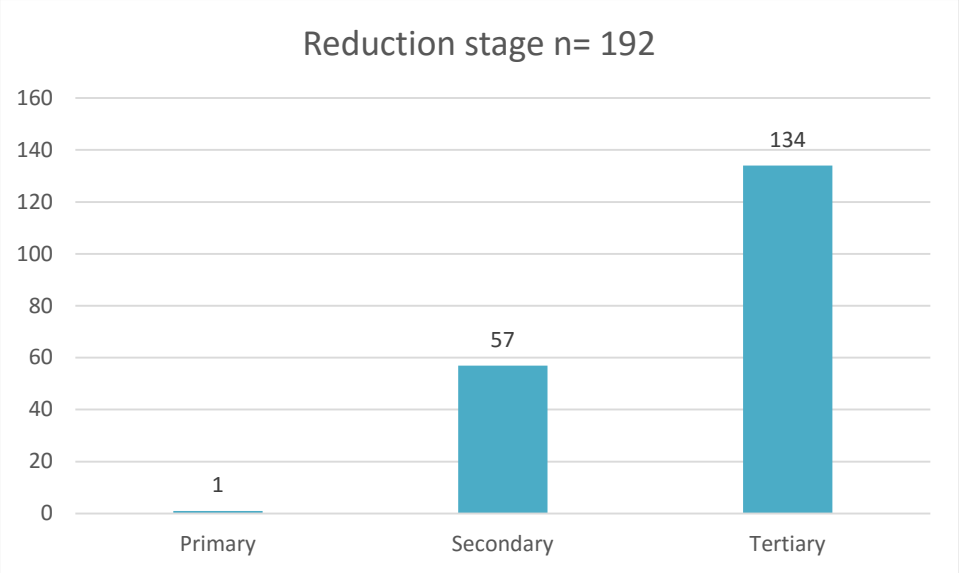
Figure 7-30. Test Excavation. Artefact size.



7.4.2.6 Reduction Stage

70 per cent of all artefacts were at a tertiary stage of reduction and were without any cortex, 30 per cent were at a secondary stage of reduction and had between 1 and 50 per cent cortex and a single artefact was at a primary stage of reduction with over 50 per cent of the artefact surface being cortex (**Figure 7–31**).

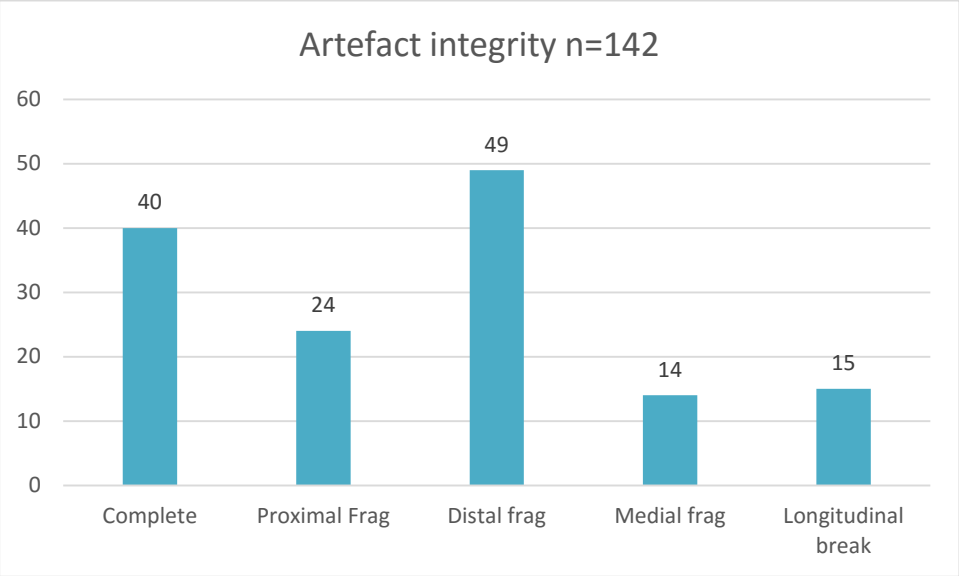
Figure 7-31. Test Excavation. Artefact reduction stage.



7.4.2.7 Integrity

Of the 142 artefacts where integrity was recorded, 40 artefacts or 28 per cent of artefacts where integrity was recorded, were complete (**Figure 7–32**). Therefore, the majority of artefacts were broken in some form with the most having lost the proximal section of the flake (distal fragment: 35 per cent), followed by flakes with the distal portion missing (proximal fragment: 17 per cent), flakes broken down the axis of percussion (longitudinal breaks: 11 per cent) and flakes with both the proximal and distal portions missing (medial fragments: 10 per cent).

Figure 7-32. Test Excavation. Artefact integrity.



7.4.2.8 Artefact Assemblage: Area by Area

Area 1

24 artefacts were recorded at Area 1 with artefacts being recorded in all transects (**Figure 7–33**). The greatest concentration was five artefacts from Tr4 Sq5 Spit 3. There was a high degree of artefacts classified as 'shatter' at Area 1 (38 per cent; **Figure 7–33**) with an almost equal proportion of artefacts catalogued as flakes. 13 per cent (n=3) are unmodified blades. One core, one backed blade and one flaked piece were also recorded. Silcrete was the most common raw material (n=13), followed by mudstone (n=9) and small amounts of quartz and volcanic stone (n=1; **Figure 7–34**). Of the 13 artefacts where integrity was recorded (i.e. excluding cores/shatter), six are complete and seven are broken in some form.

Figure 7-33. Test Excavation. Area 1 Artefact types.

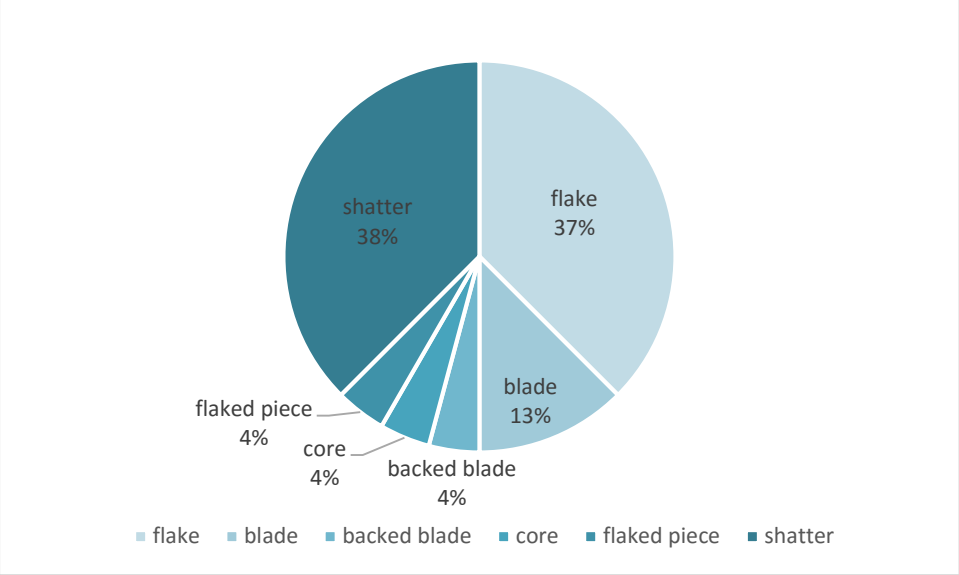


Figure 7-34. Test Excavation. Area 1 Artefact raw material.

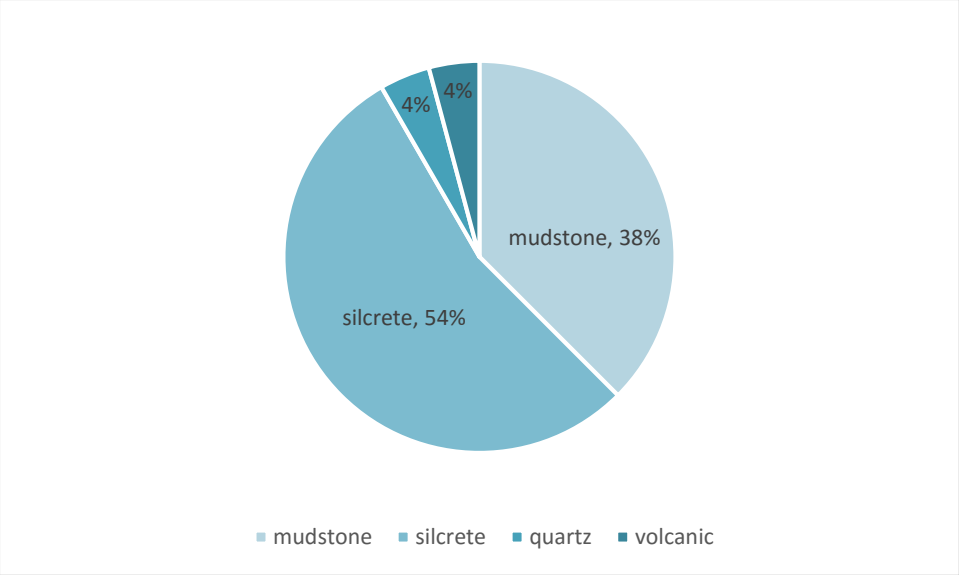


Figure 7-35. Test Excavation. Area 1 Artefacts.

1. AREA 1 TR2 SQ2 SPIT 5.

2. AREA 1 TR2 SQ9 SPIT 2.

3. AREA 1 TR2 SQ10 SPIT 4.

4. AREA 1 TR3 SQ5 SPIT 1.

Area 2

Area 2 recorded 70 artefacts with 39 (56 per cent) of these being recorded in one excavation square: Tr6 Sq3.

Analysis of the artefacts from Tr6 Sq3 show that all artefacts come from two stone sources: a banded, dark mudstone and a fine-grained pale orange mudstone (**Figure 7–37**). Further, several conjoins were noted; two in the dark, banded mudstone (two pieces [**Figure 7–39.1**] and three pieces [**Figure 7–39.2**]) and one in the pale orange mudstone (two pieces [**Figure 7–39.3**]).

Across Area 2, 87 per cent (n=61) of all artefacts were of mudstone and the remainder of silcrete (**Figure 7–39**). No other stone types were recorded. The majority of artefacts were flakes (**Figure 7–36**; n= 38) with shatter (n=17) and blades (n=12) making up a sizable proportion of the artefact assemblage for Area 2. Of the 50 artefacts for which integrity was recorded, only 18 (36 per cent) were recorded as complete with the remainder displaying a breakage of some form.

Two cores were recorded at Area 2. Both were multidirectional although one was mudstone (**Figure 7–39.4**) and the other silcrete (**Figure 7–39.5**). No cores were found associated with the concentration of artefacts at Tr6 Sq3 and while both cores showed signs of reduction, neither was exhausted and the mudstone core still retained cortex.

No retouched flakes or blades were recorded at Area 2.

Figure 7-36. Test Excavation. Area 2 Artefact types.

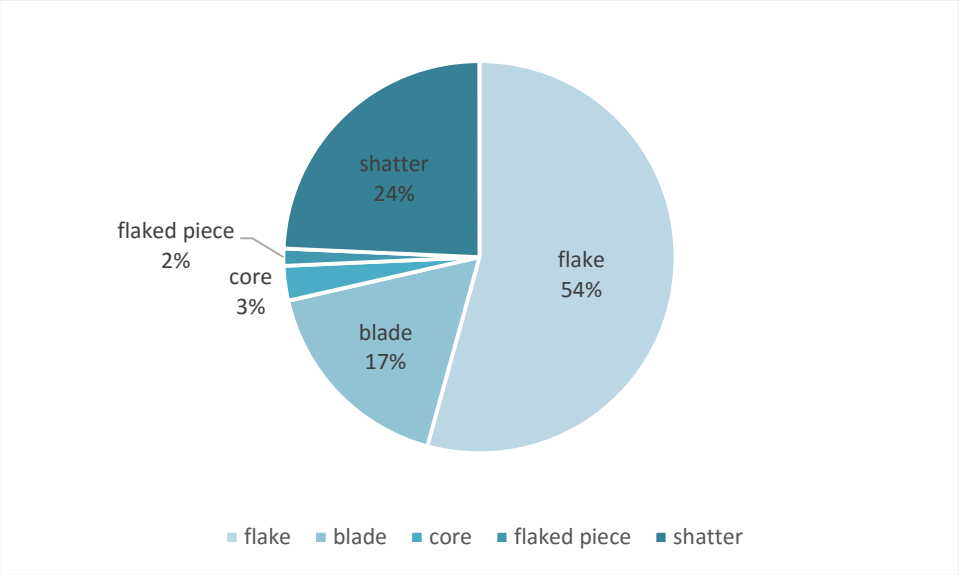


Figure 7-37. Test Excavation. Area 2 Artefact from Tr6 Sq3.

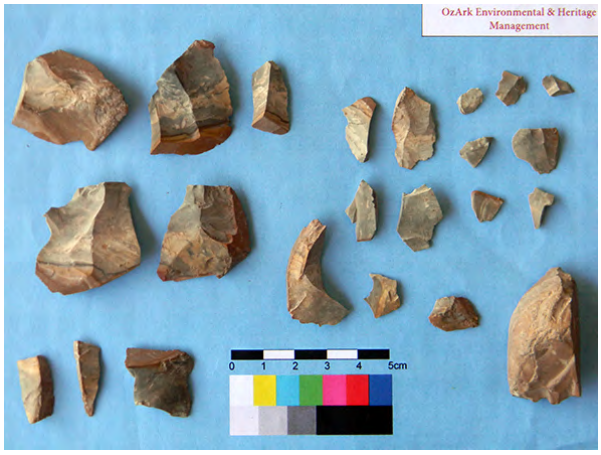
	
1. Area 2 Tr6 Sq3. All artefacts from a dark, banded mudstone.	2. Area 2 Tr6 Sq3. All artefacts from a pale orange mudstone.

Figure 7-38. Test Excavation. Area 2 Conjoins from Tr6 Sq3.

1. AREA 2 TR6 SQ3. TWO CONJOINING FLAKES IN THE DARK, BANDED MUDSTONE.

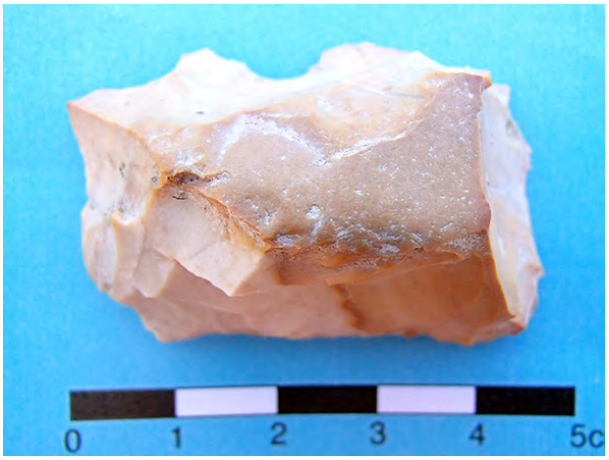
2. AREA 2 TR6 SQ3. THREE CONJOINING FLAKES IN THE DARK, BANDED MUDSTONE.

3. AREA 2 TR6 SQ3. TWO CONJOINING FLAKES IN THE PALE ORANGE MUDSTONE.

Figure 7-39. Test Excavation. Area 2 Artefacts.

1. AREA 2 TR5 SQ5 SPIT 1.

2. AREA 2 TR6 SQ2 SPIT X.

	
3. AREA 2 TR6 SQ4 SPIT X.	4. AREA 2 TR7 SQ1 SPIT X.
	5. AREA 2 TR9 SQ2 SPIT X.

Area 3

Only two artefacts were recorded at Area 3; a broken mudstone blade (**Figure 7–40**) and a silcrete flake.

Figure 7-40. Test Excavation. Area 3 Artefacts.

	1. AREA 3 TR1 SQ2 SPIT 2.

Area 4

56 artefacts were recorded at Area 4 with 23 (41 per cent) being recorded in one excavation square (Tr4 Sq2) and 14 (25 per cent) being recorded in another (Tr2 Sq5). At both of these excavation squares silcrete was the only raw material present. Tr2 Sq5 contained two cores although none of the flakes conjoined with the cores or each other. They do, however, appear to be of the same silcrete source; a pale grey with red banding stone. At Tr4 Sq2, the artefacts were all small (in the majority less than 20mm) making the determination of conjoins difficult. Although no conjoins were noted, the flakes and blades of Tr4 Sq2 appear to be from the same stone source (**Figure 7–42.2** to **.4**).

Across Area 4, 52 artefacts (93 per cent) of all artefacts were silcrete with only four mudstone artefacts recorded. Of the 46 artefacts for which integrity was recorded, five were recorded as complete with the remainder (89 per cent) displaying a breakage of some sort: the majority (n=22) are recorded as distal fragments and have the proximal portion of the flake/blade missing.

Flakes were the most-common artefact type (**Figure 7–41**; n=26) and Area 4 recorded a high proportion of blades (n=19). Compared with other test excavation areas, the proportion of shatter was lower (n=7) and cores more frequent (n=3). One backed blade was recorded (**Figure 7–42.6**).

Cores were all of silcrete and multidirectional (**Figure 7–42.1** and **7–42.2** [lower left]). All cores had been reduced to a reasonably small size.

Figure 7-41. Test Excavation. Area 4 Artefact types.

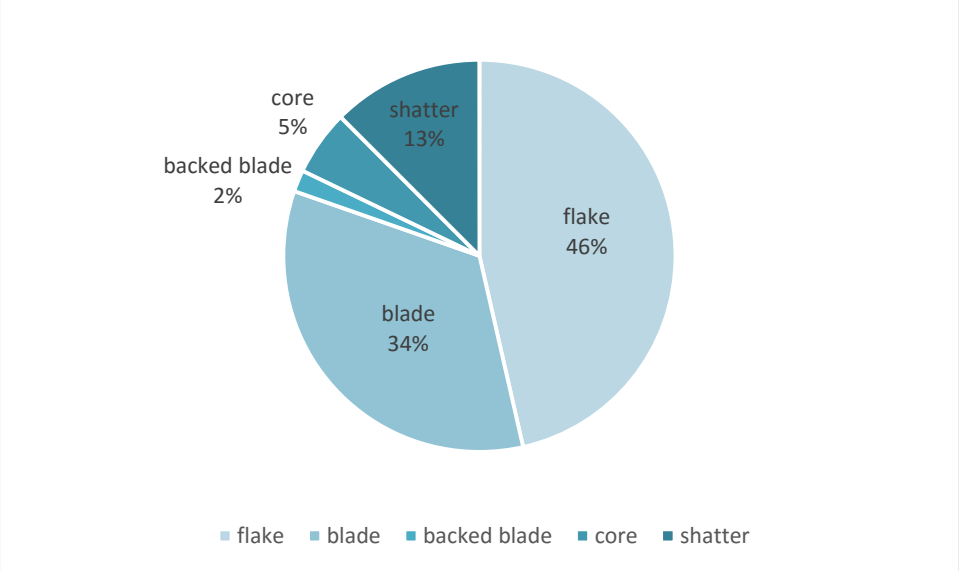


Figure 7-42. Test Excavation. Area 4 Artefacts.

1. AREA 4 TR1 SQ2 SPIT X.

2. AREA 4 TR2 SQ5 SPIT X.

3. AREA 4 TR4 SQ2 SPIT 2.

4. AREA 4 TR4 SQ2 SPIT 3.

5. AREA 4 TR4 SQ3 SPIT X.

6. AREA 4 TR4 SQ3 SPIT X.

Area 5

No artefacts were recorded at Area 5.

Area 6

40 artefacts were recorded at Area 6, all from transect 3. 30 (75 per cent, n=30) of the artefacts are from mudstone sources while the remaining 25 per cent are from silcrete sources. Of the 31 artefacts for which integrity was recorded, 32 per cent (n=10) are recorded as complete with the reminder displaying a breakage of some sort: most frequently distal fragments (n=8) where the proximal portion of the flake/blade is missing.

The most-common artefact type are flakes (**Figure 7–43**: n=25) with a large proportion of shatter (n=8) within the total assemblage. No cores were recorded at Area 6. Three backed blades (**Figure 7–44.3**) were recorded; all with retouch to one margin.

Figure 7-43. Test Excavation. Area 6 Artefact types.

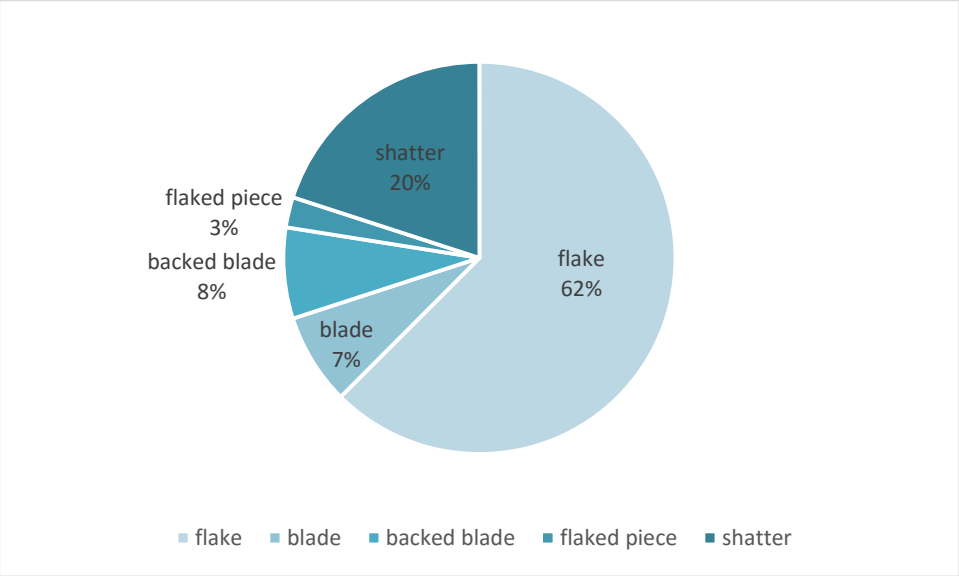


Figure 7-44. Test Excavation. Area 6 Artefacts.

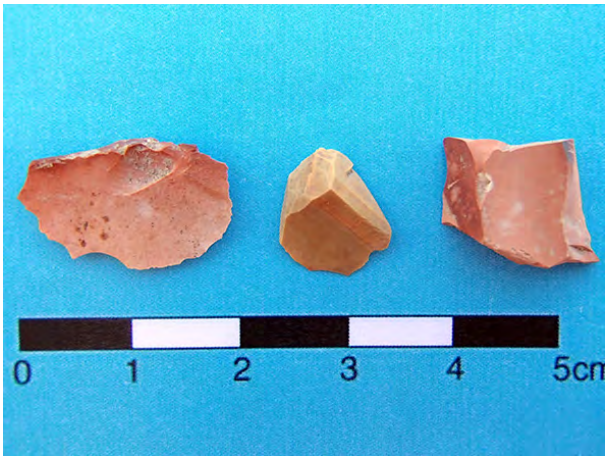
1. AREA 6 TR3 SQ4 SPIT X.

2. AREA 6 TR3 SQ5 SPIT X.

3. AREA 6 TR3 SQ5 SPIT X.

4. AREA 6 TR3 SQ6 SPIT X.

5. AREA 6 TR3 SQ9 SPIT X.



6. AREA 6 TR3 SQ10 SPIT X.

A full artefact catalogue of all test excavation areas is presented in **Appendix 21**.

7.5 THE AUGER PROGRAM

The auger program was designed to test soil depths in areas assessed as having shallow A Horizon soils and to gain further understanding of the soil profile at locations where ground surface visibility was hindered by ground cover or leaf litter (most often Casuarina needles). A supplementary outcome was to determine if the Survey Area contained buried A Horizon soil layers with archaeological potential. The aim was never to geomorphologically map the Survey Area, nor to examine soil types in great detail. Simply, the program was used as a tool to determine archaeological potential and to evaluate initial assessments of archaeological potential with a little more certainty.

7.5.1 Methods

The auger program most commonly took the form of the sequence below:

1. A linear transect was positioned to sample a cross-section of a particular landform. This would commonly be from the bank of a waterway, across the creek flats and up the lower slopes. Alternatively, in areas away from waterways, a transect, or perhaps groups of two probes, would be established to sample a particular landform.
2. Along a transect, probe locations would be established, at a minimum, every 10m although some probes were more widely spaced so as to cover a more expansive landform.
3. Probes would be undertaken using a 100mm hand auger; most-commonly to a depth of around one metre.
4. The auger head would excavate and hold approximately 5cm of soil on average before it was retrieved from the probe. On a spread tarpaulin, each 'spit' of c. 5cm was laid in sequence until 20 spits were excavated (equivalent to around one metre depth).
5. The sequence of spits was photographed in its entirety and then a selection of 4-5 spits that characterised the sequence within the soil profile were photographed. The landform of the probe was also photographed.
6. The sequence was described in a note-book to characterise the soil profile.
7. Selected probes were described using Munsell colour charts and the soil's pH was tested.
8. Following recording the soil was backfilled into the probe.

7.5.2 Location of auger probes

The auger probes were concentrated along Redbank Creek as landforms adjacent to this waterway showed the most archaeological potential. However, probes were also undertaken on the lower slopes and crests of hills to the south of Redbank Creek in order to gain an appreciation of soil conditions at locations away from waterways (**Figure 7–2**).

The auger locations and their landscape context are described below.

Auger location 1

During the survey, a number of artefacts were recorded on the banks of the northern arm of Redbank Creek in an area where the effects of sheetwash and gully erosion are manifest. This location is close to the headwaters of the northern arm of Redbank Creek and an auger examination at this location allowed the headwater landforms to be investigated. The landforms have a moderate slope surrounding a narrow creek flat in an area that is generally rising to more steep gradient hills to the immediate west.

Five auger probes (1.1 to 1.5) were placed in landforms adjacent to severe gully erosion adjacent to the creek at this location. The gully erosion section also indicated that there may be a buried A Horizon soil strata at this location. A further three probes (1.6 to 1.8) were investigated to the south of the creek in an area of past sheetwash erosion. Although artefacts were recorded in this area during the survey, the auger probes were to determine if any A Horizon soils remained *in situ*.

Auger location 2

Six probes (2.1 to 2.6) were located on the northern/eastern bank of the northern arm of Redbank Creek approximately 500m downstream from auger location 1. The location was chosen for two reasons. Firstly there was very little ground surface visibility in this portion of Redbank Creek and the augers would allow the soil profiles to be investigated. Secondly, Redbank Creek is deeply incised at this location with 3m banks. An examination of the bank during the survey showed a clear buried A Horizon soil strata and the auger program was to determine the extent of this buried soil strata. Three probes (2.1 to 2.3) were placed along the creek bank in the area where the buried soil horizon was identified and a further three probes (2.4 to 2.6) investigated the generally flat landform to the east of the creek in three 10m increments (therefore examining up to 30m from the creek bank).

The landform in this area is flat with often thick regrowth Casuarina and long grasses.

Auger location 3

This location was to examine a portion of Redbank Creek situated between two test excavation areas; Area 2 and Area 3. Further, during the survey, a number of artefacts were recorded along a track that crosses the floodplain for Redbank Creek at this location and the auger program was designed to investigate the nature of the floodplain soils to determine archaeological potential.

Three probes (3.1 to 3.3) were placed to span the track on the floodplain and a further three probes (3.4 to 3.6) were placed 10m apart running back from the southern bank of Redbank Creek (therefore investigating approximately 25m of the bank landform).

All probes were in a flat landform adjacent to the creek. The probes on the floodplain were in a cleared paddock with thick grass cover while the probes adjacent to Redbank Creek are within

thick regrowth Casuarina woodland where the ground surface is completely obscured by Casuarina needles.

Auger location 4

During the survey a number of artefacts were recorded along a track that climbs a hill of moderate gradient to the south of Redbank Creek. The opportunity was therefore afforded to not only investigate the extent of A Horizon soil depth (that was assessed during the survey to be shallow or non-existent) but also to examine the soil profile on the hill slopes and crest of a typical landform outside of the landforms adjacent to Redbank Creek.

Seven probes were excavated (4.1 to 4.7) spanning 500m of the hill slope and crest area of this landform. The gravelly soils at this location supported a regrowth Eucalyptus woodland with sparse ground cover.

Auger location 5

This location was chosen as the area on either side of Redbank Creek to the east of Dam 1 was dominated by a very thick stand of regrowth Casuarina making an accurate assessment of archaeological potential during the survey difficult.

Seven probes were investigated (5.1 to 5.7) covering approximately 200m along both sides of Redbank Creek: 5.1 and 5.6 are located on the eastern bank, while the others are all located on the western bank.

The landform is flat to the west of the creek and after a very narrow creek flat on the eastern bank the landform rises to the east before being cut by an old alignment for the Golden Highway. Within the dense Casuarina woodland there are old channels of Redbank Creek (5.7 was located within one such palaeochannel which was only barely discernible on the ground) and minor tributaries to the creek although it is difficult to accurately determine their exact alignments due to the dense vegetation.

Auger location 6

Located opposite test excavation Area 1, this transect contains 10 probes (6.1 to 6.10) which comprehensively sampled the entire surviving landform on the southern bank of Redbank Creek in this area. The transect, in 10m increments, crosses the creek's floodplain and includes the southern fringing hills to the south of Redbank Creek. The transect terminates at the edge of an overburden emplacement. The transect samples approximately 115m of this landform.

The landform, apart from some fringing trees along Redbank Creek, is largely cleared although some mine-related tree planting exists in the southern portion of the transect.

Auger location 7

The location 7 transect is located on the southern bank of what would have been (prior to mining) the main arm of Redbank Creek. The transect consists of six probes (7.1 to 7.6) with 7.1 close to the bank of the creek and 7.6 located 60m to the southeast. The transect crosses the creek flats and terminated as the toe slope of the fringing hills to the south of Redbank Creek. Thus location 7 primarily sampled the creek flats where a number of artefacts were recorded during the survey. The main aim was to investigate the nature of the creek flat deposits in order to assess their archaeological potential.

Auger location 8

Location 8 is situated on either side (north and south) of test excavation Area 2. The major portion of the transect (8.1 to 8.4) sampled, in 10m increments, the landform between an anabranch of Redbank Creek and the main creek channel to the north (conversely, Area 2 Tr3, Tr4 and Tr5 are located on the southern bank area of the anabranch). A further two probes (8.5 and 8.6) were placed at the break of slope in a bench within the fringing hills to the south of Redbank Creek.

8.1 to 8.4 are in a landform that rises at a moderate gradient to the north from the anabranch. The northern-most probe (8.4) is located on the crest just south of the steep drop-off to the main channel of Redbank Creek that is located to the north. 8.5 and 8.6 are located just beyond the break of slope to a bench landform within the hills to the south of Redbank Creek.

While there are some scattered, immature regrowth trees in the area, auger location 8 is within a largely cleared landscape.

Auger location 9

In the supplementary survey of landforms to the north of Wambo's Montrose Pit a number of artefacts were recorded during the survey within a travelling stock route. The auger program in this area was to investigate the depth of the A Horizon soils to determine the archaeological potential of this area.

Three probes (9.1 to 9.3) were investigated adjacent to where the artefacts were recorded during the assessment.

Location 9 is situated in a sloping landform with a gentle gradient. The area investigated contains scattered trees and a variable grass covering.

Conclusion

Over the nine investigation areas, 59 probes were investigated, each with an average depth of one metre. Location 1, 2, 3, 5, 6, 7 and 8 investigated landforms adjacent to Redbank Creek, Location 4 investigated landforms in the fringing hills to the south of Redbank Creek. All of these

landforms are within the Redbank Creek catchment. Location 9 investigated a landform within the Waterfall Creek catchment that is located to the northwest of the Redbank Creek catchment.

7.5.3 Results of the Auger Program

The overall aims of the auger program were successful and the addition of this aspect to the test excavation program allowed a more-comprehensive examination of the Survey Area than would have been possible by the excavation of test pits alone. In general, the auger program showed:

- A Horizon soils are thin across the Survey Area. Where the A Horizon is present at depth it is rarely deeper than 20cm and often consists of a silty, light grey clay loam. This soil composition indicates leaching, and in places, re-deposition from erosional activities;
- The B Horizon clays are reasonably consistent across the Survey Area and while some areas contain a higher sand content, or a higher water content, the B Horizon is deep and no probe reached the bottom of the B Horizon except where bedrock was encountered; and
- Buried A Horizon soils are present within the Survey Area but these are limited in their extent and probably relate to a local depression having sediment washed into it rather than a wider phenomenon.

The remainder of this section will briefly present the results of the auger program at each of the nine locations investigated (see **Section 7.5.2** for a discussion of the topographic conditions at each of these locations). The 'spits' are roughly equivalent to 5cm and colour references are from the Munsell colour system.

Location 1

The large extent of gully erosion revealed a buried soil horizon at this location (**Figure 7–45**) and several probes were excavated adjacent to the exposed section to try and determine the extent of the buried soil horizon. One of the closest probes was probe 2, located 3m back from the gully edge, which returned the following results:

Location 1; Probe 2 (**Figure 7–46**)

Spit 1: yellowish brown clay loam (10YR 5/4)

Spits 2–10: dark yellowish brown friable clay (10YR 4/4)

Spits 11–13: very dark greyish brown loam (10YR 3/2). Buried soil layer

Spits 14–15: very dark brown clay (10YR 2/2)

Spits 16–20: dark yellowish brown friable clay (10YR 3/4).

Probe 5 is located approximately 50m further away from probe 2 and away from the gully erosion. However, the transect (i.e. probes 2–5) is positioned parallel to the northern arm of Redbank Creek meaning probe 2 and probe 5 are equidistant from the creek (approximately 40m).

Location 1 Probe 5

Spits 1–8: yellowish brown friable clay (10YR 5/6)

Spit 9: very dark greyish brown loam (10YR 3/2)

Spits 10–12: very dark brown friable clay (10YR 2/2)

Spits 13–17: very dark brown non-friable clay (10YR 2/2)

Spits 18–20: yellowish brown non-friable clay (10YR 5/6).

These results tend to indicate that the buried soil layer observed at probe 2 (spits 11–13) remains present at probe 5, although thinner (spit 9) and with a higher clay content. As probe 5 is at a higher altitude than probe 2 the results indicate that the buried soil layer is confined to a depression now largely removed by gully erosion. There was no indication at any probe at Location 1 that the buried soil horizon was associated with archaeological deposits.

Location 2

Like Location 1, Location 2 was positioned to investigate a buried soil horizon observed in the eastern bank of the northern arm of Redbank Creek. Probe 1 was located immediately adjacent to where the soil horizon was observed in the creek bank section.

Location 2 Probe 2 (**Figure 7–47**)

Spit 1: dark greyish brown loam (topsoil) (10YR 4/2)

Spits 2–4: yellowish brown friable clay (10YR 5/6)

Spit: 5: very dark brown non-friable clay (10YR 2/2)

Spit 6: dark yellowish brown non-friable clay (10YR 4/6)

Spits 7–15: yellowish brown friable clay (10YR 5/4).

Probe 5 is located approximately 20m east from the current bank edge.

Location 2 Probe 5 (**Figure 7–48**)

Spits 1–2: dark greyish brown loam (topsoil) (10YR 4/2)

Spit 3: brown friable loam (10YR 5/3)

Spits 4–5: yellow friable clay (10YR 7/6)

Spits 6–20: dark yellowish brown friable clay (10YR 4/4).

The lack of any profile discontinuity in probe 5 indicated that the probe 2 (spit 5) buried soil layer is not extensive and is not present 20m back from the creek bank where it was observed. No probes at Location 2 indicated that there were subsurface archaeological deposits at this location.

Location 3

The probes at location three were spilt between those on the floodplain (probes 1–3) and those on the bank of Redbank Creek (probes 4–6).

Location 3 Probe 3 (**Figure 7–49**)

Spit 1: dark yellowish brown non-friable clay (10YR 4/6)

Spits 2–3: greyish brown non-friable clay (10YR 5/2)

Spits 4–6: brown non-friable clay (10YR 5/3)

Spits 7–9 yellowish brown non-friable clay (10YR 5/4)

Spits 10–15: yellowish brown friable clay (10YR 5/4).

The high clay content of probes 1–3 indicates that topsoil loams have been stripped from these locations and the floodplain is unlikely to contain archaeological deposits.

Location 3 Probe 4 (**Figure 7–50**)

Probe 4 is located directly on the current bank of Redbank Creek.

Spit 1: dark greyish brown loam (10YR 4/2)

Spits 2–4: dark brown friable clay (10YR 3/3)

Spit 5: yellowish brown friable, sandy clay (10YR 5/4)

Spits 6–11: pale brown friable, sandy clay (10YR 6/3)

Spits 10–15: brown friable clay (10YR 4/3).

Probe 4 soil profile was markedly different to the probe 3 profile as heavy, non-friable clays were absent. In their place were light-coloured sandy, friable clays suggestive of leached or re-deposited soil layers closer to Redbank Creek. The soil profiles at Location 3 did not suggest that there may be subsurface archaeological deposits at this location.

Location 4

Location 4 is located with a slope and crest landform to the south of Redbank Creek. Soil depths were shallow when compared to locations closer to Redbank Creek and bedrock was reached at several of the probe locations.

Location 4 Probe 3 (**Figure 7–51**)

Probe 3 is located on a sloping landform.

Spits 1–4: light brownish grey friable clay (slope wash colluvium?) (10YR 6/2)

Spits 5–15: brown, medium friable clay (10YR 5/3).

Location 4 Probe 6 (**Figure 7–52**)

Probe 6 is located on a crest landform.

Spits 1–4: light brownish grey friable clay (slope wash colluvium?) (10YR 6/2)

Spits 5–6: light brownish grey medium-friable clay (10YR 6/2)

Spits 7–8: yellowish brown medium-friable clay (10YR 5/4)

Spits 9–12: brownish yellow medium-friable clay with decomposed conglomerate nodules at lower depths (10YR 6/6).

Soil profiles at Location 4 displayed little topsoil and evidence of slope wash. There is a very low probability of these profiles containing subsurface archaeological deposits.

Location 5

Location 5 is located on either side of Redbank Creek to the east of Dam 1.

Location 5 Probe 1 (**Figure 7–53**)

Spits 1–3: light brownish grey sandy clay (colluvium?) (10YR 6/2)

Spits 4–5: greyish brown friable clay (10YR 5/2)

Spits 6–20: dark yellowish brown clay becoming more non-friable from spit 17 (10YR 4/4).

Location 5 Probe 7 (**Figure 7–54**)

Spit 1: yellowish brown sandy alluvium (10YR 5/4)

Spits 2–16: yellow, sandy alluvium with no discernible change (10YR 7/6).

The results from location 5 indicate both the stripping of topsoils (probe 1) and a history of channel change and re-deposition associated with Redbank Creek (probe 7). In such a fluctuating environment, the probability of intact, subsurface archaeological deposits at this location is extremely low.

Location 6

Location 6 transect sampled the entire landform from the southern bank of Redbank Creek and across the adjacent floodplain and lower slopes. Probe 4 (**Figure 7–55**) is located approximately 25m south of the current bank of Redbank Creek, probe 7 (**Figure 7–56**) is located at the southern extent of the floodplain and at the base of the adjoining lower slopes and probe 10 (**Figure 7–57**) is located on a bench landform within the lower slopes approximately 110m south of Redbank Creek.

Location 6 Probe 4 (**Figure 7–55**)

Spits 1–5: dark yellowish brown non-friable clay (10YR 4/4)

Spits 6–10: brown, non-friable clay (10YR 5/3)

Spits 10–20: yellowish brown friable clay (10YR 5/4).

Location 6 Probe 7 (**Figure 7–56**)

Spit 1: dark brown topsoil (10YR 3/3)

Spits 2–7: brown non-friable clay (10YR 4/3)

Spits 11–20: pale brown friable clay (10YR 6/3). Increasing 'chunks' of weathered clay from spit 16.

Location 6 Probe 10 (**Figure 7–57**)

Spit 1: dark yellowish brown topsoil (10YR 4/4)

Spits 2–4: dark yellowish brown friable clay (10YR 4/4)

Spits 5–10: dark yellowish brown non-friable clay (10YR 4/6)

Spits 11–14: yellowish brown non-friable clay (10YR 5/6)

Spits 15–20: brownish yellow friable clay (10YR 6/8).

As was noted at Location 3, the floodplain soil profiles were dominated by heavy, non-friable clays with little or no topsoil. The base of the slopes (probe 7) contained a little topsoil but the profile continued to be dominated by clays. Profiles on the slopes and mid-slope bench contained shallow topsoils and more friable clays. The profiles investigated at Location 6 did not suggest buried soil layers, former channels of Redbank Creek (i.e. no probe encountered alluvium as did Location 5 probe 7) nor the likelihood of subsurface archaeological deposits.

Location 7

Location 7 is a single transect that extends approximately 50m from the southern bank of the main arm of Redbank Creek across the adjacent creek flats.

Location 7 Probe 1 (**Figure 7–58**)

Probe 1 is located directly at the top of the bank for Redbank Creek.

Spits 1–6: dark greyish brown non-friable clay (10YR 4/2)

Spits 7–15: dark yellowish brown clay (10YR 3/6).

Location 7 Probe 5 (**Figure 7–59**)

Spit 1: dark yellowish brown loam (YR10 4/4)

Spits 2–8: brown non-friable clay (10YR 4/3)

Spits 9–15: brown friable clay (10YR 4/3).

Location 7 displayed unremarkable soil profiles with the creek flat profiles being dominated by heavy, non-friable clays as has been seen previously at Locations 3 and 6. While those probes closer to Redbank Creek showed more A Horizon soil depth, no probe indicated that subsurface archaeological deposits are likely.

Location 8

Location 8 was split between two topographic zones. Probes 1–4 investigated a landform between Redbank Creek and an anabranch that flows to the south of the main channel, while probes 5–6 investigated the lower slopes to the south of the anabranch. Location 8 is in the same vicinity as Test Excavation Area 2. Probes 5–6 were relatively shallow (71cm and 65cm respectively) and displayed thin topsoils (5–10cm) overlaying yellowish brown clays. There was no indication of subsurface archaeological deposits at the location of these probes.

Probes 1–4 investigated a landform with greater archaeological potential.

Location 8 Probe 2 (**Figure 7–60**)

Probe 2 is located in a landform that slopes to the south towards the anabranch of Redbank Creek.

Spits 1–4: pale brown sandy clay (colluvium?) (10YR 6/3)

Spits 5–6: pale brown medium-friable clay with more ‘chunks’ of clay (10YR 6/3). Spit 5 included a mudstone core.

Spits 7–9: brownish yellow medium-friable clay (10YR 6/6)

Spits 10–20: dark yellowish brown friable clay (10YR 4/6).

The artefact recovered from probe 2 spit 5 is associated with the leached soils at the top of the sequence and has probably been washed into this location through colluvial deposition.

Location 8 Probe 4 (**Figure 7–61**)

Probe 4 is located at the crest of the landform just before it drops of, relatively steeply, to Redbank Creek to the north.

Spit 1: brown loam topsoil (10YR 4/3)

Spits 2–4: dark greyish brown sandy clay (10YR 4/2)

Spits 5–8: strong brown friable clay (7.5YR 4/6)

Spits 9–10: strong brown friable clay with rounded pebbles (7.5YR 4/6)

Spits 11–20: reddish yellow friable clay (7.5YR 6/8).

Although an artefact was recovered from one probe at Location 8, this artefact is probably in a secondary context. However, the area investigated by Location 8 probes 1–4 is a residual

fragment of landform adjacent to Redbank Creek that has probably, due to the slope, never been ploughed. While the probes displayed a lot of evidence of sheetwash erosion and colluvial deposition there is a possibility that this landform could contain some isolated pockets of subsurface archaeological deposits.

Location 9

Located within a Travelling Stock Reserve, Location 9 investigated soil depth in an area where surface artefacts had been recorded during the survey.

Location 9 Probe 1 (**Figure 7–62**)

Spits 1–5: dark yellowish brown loam (10YR 4/6)

Spits 6–10: dark brown non-friable clay (10YR 3/3)

Spits 11–13: strong brown non-friable clay (7.5 YR 4/6)

Spits 14–21: yellowish brown friable clay (10YR 5/6).

Location 9 Probe 2 (**Figure 7–63**)

Spits 1–3: light yellowish brown loam (10YR 6/4)

Spits 4–7: brownish yellow non-friable clay (10YR 6/8)

Spits 11–14: brownish yellow friable clay (10YR 6/8)

Spits 15–19: yellow clay, very friable (10YR 7/6).

The soil profiles at Location 9 were unremarkable and displayed relatively shallow topsoils overlying leached clays. The dryness of the soil profile is perhaps indicative of the raised altitude of Location 9 that overlooks Waterfall Creek and its tributary. As there is some soil depth at Location 9 subsurface archaeological deposits are possible but it is considered that this would be unlikely.

Figure 7-45. Auger location 1, probe 1.

<table>
<tr><td colspan="3">  </td><td>  </td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>AUGER LOCATION 1
PROBE 1
DIRECTLY BEHIND PROFILE DISCONTINUITY IN SECTION ABOVE.</td></tr>
<tr><td>SPIT 4</td><td>SPIT 9</td><td>SPIT 19</td><td></td></tr>
</table>

Figure 7-46. Auger location 1, probe 2.

<table>
<tr><td colspan="3">  </td><td>AUGER LOCATION 1
PROBE 2
ON OTHER SIDE OF EROSION GULLY FROM 1.1.</td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>SPIT 2</td><td>SPIT 10</td><td>SPIT 12</td><td>SPIT 15</td></tr>
</table>

Figure 7-47. Auger location 2, probe 2.

AUGER LOCATION 2
PROBE 2
DIRECTLY BEHIND BURIED SOIL LAYER IN SECTION ABOVE.

SPIT 4 | SPIT 6 | SPIT 12

Figure 7-48. Auger location 2, probe 5.

AUGER LOCATION 2
PROBE 5
30M EAST OF REDBANK CREEK.

SPIT 3 | SPIT 10 | SPIT 15 | SPIT 20

Figure 7-49. Auger location 3, probe 3.

AUGER LOCATION 3
PROBE 3
CREEK FLATS 150M SOUTH OF REDBANK CREEK.

SPIT 1

SPIT 3

SPIT 8

SPIT 13

Figure 7-50. Auger location 3, probe 4.

AUGER LOCATION 3
PROBE 4
DIRECTLY ON SOUTHERN BANK OF REDBANK CREEK.

SPIT 1

SPIT 6

SPIT 11

SPIT 16

Figure 7-51. Auger location 4, probe 3.

AUGER LOCATION 4
PROBE 3
HILLSLOPE 350M SOUTH OF REDBANK CREEK.

LOCATION 4.1

SPIT 1

SPIT 6

SPIT 11

Figure 7-52. Auger location 4, probe 6.

AUGER LOCATION 4
PROBE 6
CREST 750M SOUTH OF REDBANK CREEK.

LOCATION 4.6

SPIT 2

SPIT 7

SPIT 12

Figure 7-53. Auger location 5, probe 1.

AUGER LOCATION 5
PROBE 1
EASTERN BANK, 20M FROM REDBANK CREEK.

SPIT 1

SPIT 6

SPIT 11

SPIT 16

Figure 7-54. Auger location 5, probe 7.

AUGER LOCATION 5
PROBE 7
WITHIN OLD CHANNEL FOR REDBANK CREEK.

SPIT 1

SPIT 6

SPIT 11

SPIT 16

Figure 7-55. Auger location 6, probe 4.

AUGER LOCATION 6
PROBE 4
MIDDLE OF CREEK FLAT.

SPIT 4

SPIT 4

SPIT 9

SPIT 19

Figure 7-56. Auger location 6, probe 7.

AUGER LOCATION 6
PROBE 7
EDGE OF CREEK FLAT, FOOT OF TOE SLOPE.

SPIT 4

SPIT 4

SPIT 9

SPIT 19

Figure 7-57. Auger location 6, probe 10.

AUGER LOCATION 6
PROBE 10
RIDGE CREST TO SOUTH OF REDBANK CREEK.

SPIT 2

SPIT 7

SPIT 12

SPIT 17

Figure 7-58. Auger location 7, probe 1.

AUGER LOCATION 7
PROBE 1
ON BANK OF REDBANK CREEK.

AUGER LOCATION 7.1

SPIT 3

SPIT 8

SPIT 13

Figure 7-59. Auger location 7, probe 5.

AUGER LOCATION 7
PROBE 5
40M SOUTHEAST FROM BANK OF REDBANK CREEK.

AUGER LOCATION 7.5

SPIT 2

SPIT 7

SPIT 12

Figure 7-60. Auger location 8, probe 2.

AUGER LOCATION 8
PROBE 2
MID-SLOPE ON NORTHERN BANK OF ANABRANCH TO REDBANK CREEK.

SPIT 2

SPIT 5 WITH ARTEFACT

SPIT 8

SPIT 20

Figure 7-61. Auger location 8, probe 4.

<table>
<tr><td colspan="3">  </td><td>AUGER LOCATION 8
PROBE 4
CREST TOP BETWEEN REDBANK CREEK AND ANABRANCH TO REDBANK CREEK.</td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>SPIT 4</td><td>SPIT 9</td><td>SPIT 14</td><td>SPIT 19</td></tr>
</table>

Figure 7-62. Auger location 9, probe 1.

<table>
<tr><td colspan="3">  </td><td>AUGER LOCATION 9
PROBE 1
UNDULATING SLOPES ABOVE WATERFALL CREEK.</td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>SPIT 1</td><td>SPIT 8</td><td>SPIT 12</td><td>SPIT 21</td></tr>
</table>

Figure 7-63. Auger location 9, probe 2.

<table>
<tr><td colspan="2">  </td><td colspan="2">AUGER LOCATION 9
PROBE 2
UNDULATING SLOPES ABOVE WATERFALL CREEK.</td></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>SPIT 1</td><td>SPIT 8</td><td>SPIT 15</td><td>SPIT 19</td></tr>
</table>

8 DISCUSSION

8.1 DISCUSSION OF SURVEY RESULTS

8.1.1 Surface Survey Summary

The pedestrian survey of the Survey Area recorded 996 artefacts. Of these artefacts:

- 683 (69 per cent) were mudstone and 265 (27 per cent) were silcrete. 14 (1.4 per cent) were volcanic and even smaller quantities of chert, quartz, quartzite and petrified wood artefacts were recorded;
- 771 (77 per cent) were unmodified flakes, 72 (seven per cent) were blades, 44 (4.4 per cent) were cores, 14 (1.4 per cent) were backed blades or flakes, 12 (1.2 per cent) were scrapers, three axe blanks (all from volcanic materials) and one microlith were recorded. 54 pieces (5.4 per cent) were classified as 'shatter';
- 702 artefacts (70 per cent) were catalogued as complete, the remainder being broken with proximal fragments (i.e. the distal portion missing) being the most common (154 artefacts; 15 per cent) followed by distal fragments (71 artefacts; seven per cent);
- 691 artefacts (69 per cent) of artefacts had no cortex (tertiary reduction stage), 281 artefacts (28 per cent) had between 1 and 50 per cent cortex (secondary reduction stage) and 25 artefacts (2.5 per cent) had over 50 per cent cortex (primary reduction stage); and
- The average artefact size was just over 30mm.

8.1.2 Discussion

Some observations on the location of recorded artefacts can be made:

- Most artefacts were closely associated to watercourses, primarily Redbank Creek;
- No major concentrations of artefacts were recorded greater than 150m from a waterway and most were recorded much closer;
- Most artefacts were assessed to be in secondary contexts, primarily in major erosion scalds alongside Redbank Creek and its anabranches;
- There is a very strong correlation between prior disturbance and the location of surface artefacts. The majority of artefacts were recorded either in areas affected by erosion or in areas affected by mining activities such as bunds, dam walls, tracks and drill pads. In most cases it is assumed that the artefacts recorded in these locations are from the general vicinity but their original deposition location is unknown. There was a lot of evidence of water movement across the Survey Area and it is likely artefacts have washed into concentrations within erosion scalds or have been uncovered by deflation on features such as bunds: exposing artefacts that had been bulldozed to that location from nearby.

- The types of artefacts recorded are very representative of other assemblages within the upper Hunter Valley. The percentage of backed artefacts and cores is similar to other investigations in the wider region; and
- Only stone artefact sites were recorded. No culturally modified trees, stone arrangements, grinding grooves, art or burial sites were recorded.

A full catalogue of all artefacts recorded during the survey is presented in **Appendix 20**.

Referring to the models set out in the predictive model (**Section 4.5.2**), the following observations can be made.

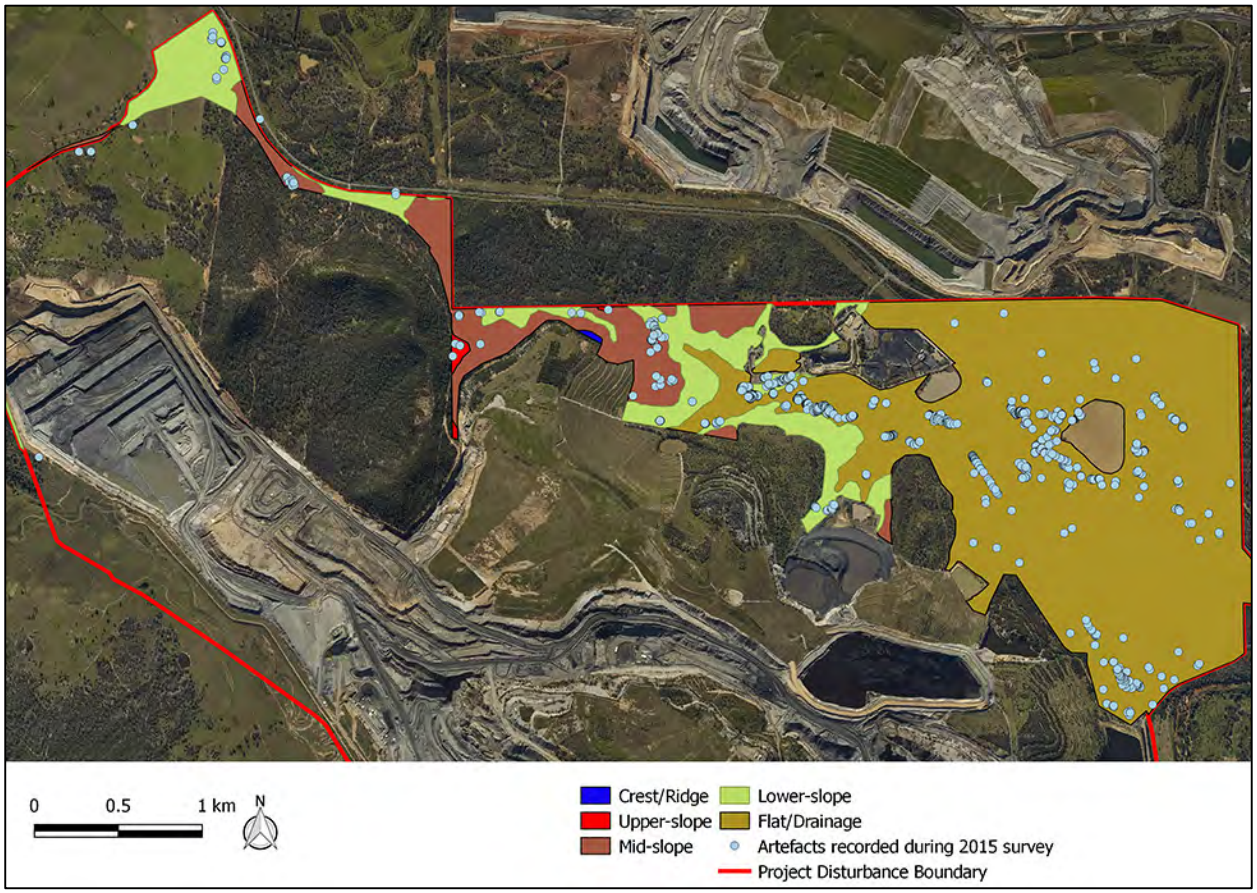
Site location model

The distribution of artefacts can be associated to landform units within the Survey Area (**Figure 8–1**). **Table 8–1** records the number of artefacts recorded and their associated landform unit. It should be noted that six artefacts were recorded outside of the Survey Area and are not included in these calculations. As can be seen, the majority of artefacts (almost 80 per cent) were recorded associated with the flat/drainage landforms in the east of the Survey Area. The correlation of site recordings to this landform unit has also been noted as a result of previous investigations within the Survey Area (**Table 4–3**; **Figure 4–4**). Further, it was along Redbank Creek and a tributary to the Wollombi Brook that the majority of the artefacts were recorded within this landform unit. These recordings commonly consisted of clusters of artefacts exposed within in-stream erosion scalds in secondary contexts. It therefore must be assumed that these artefacts have been re-deposited at these locations due to water movement. This distorts the distribution of artefacts as these artefacts may have originated in lower slope landforms, for example, and have been transported to flat/drainage landforms through erosion. So while the distribution of artefacts indicates that flat/drainage landforms were preferred occupation areas, it must be remembered that this conclusion is tempered by the knowledge that there has been large-scale disturbances within the Survey Area that may have displaced artefacts to these locations, as well as the fact that it was in flat/drainage landforms that the extensive exposures were located (**Table 5–1**). Notwithstanding these constraints, the picture that emerges within the Survey Area is that site distribution closely matches the regional paradigm that sites are more likely close to water or in lower slope landforms and less likely in other landform units. The small percentage of artefacts in crest/ridge landforms that have been noted elsewhere to be a landform potentially containing sites is perhaps attributable to the fact that the Survey Area contains a small proportion of this landform type.

Table 8-1. Recorded artefacts and associated landform units.

Landform unit	Artefact numbers	Percentage of total (n=996)
Crest/ridge	5	0.5
Upper slope	5	0.5
Mid slope	63	6.3
Lower slope	149	15
Flat/drainage	774	77.7

Figure 8-1. Recorded artefacts and landform unit.



Site type model

This model aimed to test the established paradigm that the majority of sites consist of artefact scatters or single artefacts. This paradigm was confirmed during the survey as these were the only site types recorded. It was clear that the wide-spread disturbances within the Survey Area have removed some site types such as scarred trees had they existed (note **Figure 3–9** that illustrates the near-total clearance of native vegetation from the Survey Area) and probably dispersed other site types such as stone arrangements had they existed.

Site distribution model

This model aimed to test the observation that sites in the Survey Area consist of clusters of artefacts separated by areas of low artefact density. This was not able to be confirmed during the survey as the greatest concentrations of artefacts were in secondary contexts. This gives the

impression of a continuous distribution of artefacts along drainage lines such as Redbank Creek but this interpretation is not necessarily a reflection of reality as artefacts have been displaced and have been moved to an unknown extent.

Site condition model

This model aimed to test whether degrading and aggrading landforms preserve sites in varying ways. The survey was not able to add substantially to this model. The evidence of low artefact numbers in degrading landforms is perhaps indicative of soil loss and consequential artefact loss from these landforms. However, aggrading landforms, by their nature, may mask artefact concentrations. This model was more-fully tested in the test excavation program. However, there were no areas of extensive aggrading landforms within the Survey Area and A Horizon soil depth appeared thin in most places (as evidenced in the sections of incised stream banks). At two locations the sections of incised stream banks revealed buried soil layers (both associated with Redbank Creek) and this was further examined during the geoarchaeological auger program associated with the test excavation program.

Chronological model

This model aimed to test the established paradigm that most sites date to the late Holocene epoch and that Pleistocene sites are extremely rare, if not non-existent. While not fully tested during the survey component of the assessment (the model was more-fully tested during the test excavation program), the surface artefacts recorded were universally of the sort most-commonly associated with the Holocene epoch; namely the small tool tradition including backed blades.

8.2 DISCUSSION OF TEST EXCAVATION RESULTS

At two of the locations tested during the current program (Area 2 and Area 4), previous archaeological excavation and/or surface collection has taken place: at Area 2, Margit Koettig and Phillip Hughes conducted an excavation and collection program in 1983 that recovered just under 3,000 artefacts (Koettig and Hughes 1983); at Area 4, the site Haul Road 1 (#37-6-1611), which incorporates #37-6-1020, #37-6-0136 and #37-6-1010, was subject to a surface collection and 430 artefacts were collected from an area approximately 300m^2 (HLA 2007); and in 2009 Insite Heritage (2010b) conducted subsurface investigations 20m due east of Area 4 Tr4.

The results of these salvage works will be discussed in relation to the applicable test excavation area below.

Table 8–2 is presented as a summary of the artefact analysis of the test excavation assemblage. Percentages in this table are the percentage of a particular attribute within the assemblage of a particular area; not as a percentage of the total artefact assemblage.

Table 8-2. Summary of the artefact assemblage from each test excavation area.

Area	Number of artefacts	Most-common artefact type (%)	Most-common raw material (%)	Number of complete artefacts (%)	Number and percentage of cores	Number and percentage of retouched tools
Area 1	24	Shatter (38%)	Silcrete (54%)	6 (25%)	1 (4%)	1 (4%)
Area 2	70	Flake (54%)	Mudstone (87%)	18 (36%)	2 (3%)	0
Area 3	2	n/a	n/a	n/a	0	0
Area 4	56	Flake (46%)	Silcrete (93%)	5 (11%)	3 (5%)	1 (2%)
Area 5	0	n/a	n/a	n/a	n/a	n/a
Area 6	40	Flake (62%)	Mudstone (75%)	10 (32%)	0	3 (8%)
Total	**192**					

Several observations can be made from **Table 8–2**, however, it is accepted that the small statistical sample must be treated with caution.

- Across most areas un-retouched flakes are the dominant artefact type although at Area 1 shatter was the most numerous artefact class;
- The most notable aspect of these results is that at any one location, whether the raw material is mudstone or silcrete, one or the other is clearly dominant;
- While it is accepted that there could be an analytical bias in determining whether artefacts are complete or broken, there is, nevertheless, a low proportion of complete artefacts across all areas;
- Cores, where they are present, are represented at roughly the same proportion across all areas (between 3–5 per cent of an assemblage); and
- Retouched flakes and blades are consistently a small proportion of the artefact assemblage ranging between two per cent and eight per cent (it is noted that the eight per cent result is due to the small sample size from Area 6).

Section 7.4.1 noted that the low artefact density was surprising and somewhat puzzling given the large number of surface artefacts visible at many locations. Across all areas only two concentrations of artefacts were noted (Area 2 Tr6 Sq3; Area 4 Tr4 Sq2), with a third square (Area 4 Tr2 Sq5) displaying lower artefact numbers albeit higher than surrounding squares. Each of these concentrations will be dealt with below.

Area 2 Tr6 Sq3

As noted in **Section 7.4.2.8** this concentration is an *in situ* deposit as exemplified by the types of raw materials recorded, as well as several conjoins between flakes. It has been noted, however, that excavation squares 5m to the north, south and east of this square failed to record a single artefact (although Sq2 located 10m north of Sq3 recorded seven artefacts). It is therefore clear that the concentration is an isolated phenomenon and not part of a more-extensive artefact scatter.

As this concentration is approximately 80m west of the excavations of Koettig and Hughes undertook in 1983 (particularly their squares 13-30 which occupied an identical landform), it is informative to consider their conclusions concerning this site.

The abbreviated observations below are quoted from Koettig and Hughes 1983 pp 30ff:

- The artefacts appear to be eroding out of the homogeneous 'silty' layer identified as A Horizon, which is at most 30cm deep and overlies 'orange' weathered clayey material of B Horizon. The erosion face is about 50cm high and artefactual material is spilling from A Horizon, down the slope of B Horizon material and onto the floor of the erosion scar where it is being redeposited;

- …it appears that the artefacts are being derived from within A Horizon rather than from its surface and that they have not been exposed because of the lack of erosion;

- The stratigraphy in 30B shows that there are several distinct episodes of re-deposition or reworking of the deposits in this area. The top layer is composed of very thin laminations of vari-coloured grey to light brown silt derived from the reworking of A Horizon. Below that is a brown clayey layer which probably derives from the reworking of B Horizon. Below that again is a layer of fine sand which overlies another layer of brown clay which is mixed with fine sand. This lower section does not resemble reworked deposits in other parts of the site. Given the close proximity of Area B to Redbank Creek it is suggested that these units were reworked as a consequence of flooding of the creek;

- The site encompasses several distinct clusters of artefacts against a sparse scatter of background material. These clusters (are) defined as knapping floors…;

- The knapping floors were either of silcrete or indurated mudstone, although other raw materials were present in very low numbers on some of the floors. Artefacts were usually smaller than 5cm though the occasional larger piece was noted. The only modified pieces recorded were backed pieces and these were made of the raw material predominant at the knapping floor where they occurred. Although both asymmetrical and symmetrical forms were noted the latter were rare;

- From this it appears that the knapping floors do not overlap and are usually no closer than 2m. Taking the length of the erosion face (approximately 150m) the frequency of knapping floors is one per 13m;

- The raw materials used at the site were primarily indurated mudstone and silcrete, 47 per cent and 52 per cent respectively, with quartz, chert, quartzite and other rock types constituting the remaining one per cent. …at locality 13-30 indurated mudstone accounted for 96 per cent of the assemblage;

- Red Bank Creek 5 is typified by discrete clusters of artefactual material which are distributed relatively evenly across the river terrace. The general record of the site showed that these knapping floors could be characterised as follows:

    - The knapping floors were usually confined within an area of $2m^2$, though some were more dispersed, and they varied in density from five to 38 artefacts per m^2 at the surface;

  - Silcrete and indurated mudstone were the major raw materials and usually only one or the other was the predominant raw material within any one knapping floor;
  - Most pieces were in the size ranges 1-3 and 3-5cm;
  - Backed pieces were the only diagnostic modified pieces recorded and of these the symmetrical (geometric) form is rare. They tended to be in the 2-3cm long class, with two larger ones being 3.6 and 3.4cm in length (one of these was symmetrical). Of the seven indurated mudstone floors five contained backed pieces whereas of the five silcrete ones only two were associated with backed pieces; and
  - All *in situ* pieces were found within A Horizon material.

- There was a background scatter of artefacts of varying density across the site area, but its general density was so low as to dramatically highlight the knapping floors.

This abbreviated summary of Koettig and Hughes's work provides some similarities with the current findings at Area 2; namely:

1. The isolated nature of the concentration was also noted by Koettig and Hughes in their work and the phenomenon of concentrations ('knapping floors') separated by areas low artefact density appears as true today as it was in 1983;
2. All artefacts in the current investigation are also associated with the A Horizon (Unit).
3. The 1983 excavations yielded artefact densities far beyond what was recorded in Area 2 with the current investigation. At square 1-4AA artefact densities reached 346m^2 while at the larger excavations at squares 13-30 artefact density was 130m^2. By contrast the average artefact density per 0.5m by 0.5m excavation square in Tr6 was 5.1 artefacts or around 20m^2 and at other transects much lower;
4. One raw material predominated at each 'knapping floor'. In the case of Tr6 Sq3 mudstone was the only raw material present;
5. The average size of artefacts at Tr6 Sq3 is between 10mm and 30mm. This is slightly smaller than the average artefact size noted by Koettig and Hughes;
6. No backed artefacts were recorded at Tr6 Sq3 (or within Area 2) and so there can be no comment on the similarities of backed artefacts; and
7. Stratigraphy in Koettig and Hughes's square 30 identified considerable disturbance perhaps brought about by the flooding of Redbank Creek. This was not evident in the squares excavated in the current program (**Section 7.4.2.1**). However, their general comment on the soil profiles in the area (homogeneous 'silty' layer identified as A Horizon, which is at most 30cm deep and overlies 'orange' weathered clayey material of B Horizon) was identified during the current program.

Area 4 Tr4 Sq2

There was no opportunity to expand around this excavation square during the current investigation and therefore there is little information on the spatial relationship of this concentration. It was noted in **Section 7.4.2.8** that no conjoins were noted from this square but as the artefacts were uniformly small (almost all artefacts measuring less than 20mm), ascertaining joins was difficult. However, from the evidence of the type of artefacts (more than 50 per cent are blades) and the stone type they were sourced from, it was surmised that this concentration also represents an *in situ* deposit. No cores or backed artefacts were part of the assemblage although the high number of elongate flakes (blades) confirms with Hiscock's observation (**Section 4.4.3**) that a number of elongate flakes would be produced before the most suitable was selected for backing.

Neighbouring excavation squares to Tr4 Sq2 recorded a variable artefact density (Tr4 Sq1 [5m north] recorded no artefacts while Tr4 Sq3 [5m south] recorded seven artefacts and Tr4 Sq4 [5m south of Sq3] recorded three artefacts). While further investigation would be necessary it would appear that Tr4 Sq2 may be part of a broader artefact scatter and is, perhaps, not as confined as is the case noted at Area 2 Tr6 Sq3.

Area 4 Tr2 Sq5

A smaller concentration of 14 artefacts was recorded at Tr2 Sq5. Again, it was noted in **Section 7.4.2.8**, based on the evidence of the stone type alone, that this concentration may be an *in situ* deposit.

There was the opportunity to expand around this square during the program with one square being excavated immediately adjacent to the south of Sq5 (Sq8: one artefact), one square being excavated 5m east of Sq5 (Sq7: no artefacts) and one square being excavated 5m west of Sq5 (Sq6, no artefacts). It would therefore appear that the small concentration within Sq5 is an isolated phenomenon.

Comparison with HLA 2007

The salvage investigation undertaken by HLA focused on four sites that were to be impacted by the construction of a Haul Road. No subsurface investigation formed a part of this salvage. The largest of the sites investigated was Haul Road 1 (#37-6-1611) which covered the same landform as that of Area 4.

HLA 2007 noted in summary that:

- A large discrepancy in the number of lithic artefacts recovered from the four sites along the Haul Roads. Site #37-6-1611 accounted for 70 per cent of all collected items, while site #37-6-1612 (located 230m north of site #37-6-1611) accounted for only 1.8 per cent of items;

- The use of a similar range of sedimentary rock types across all four sites was noted, with quartz representing only a small proportion of any assemblage, although the report does not quantify this;
- The presence of two hammerstones at site #37-6-1611 and site #37-6-1614, demonstrated to the archaeologists that flaked tools were manufactured at these sites;
- Backed blades and backed blade segments are present in small numbers In the assemblages from site #37-6-1611 and #37-6-1613;
- The presence of two core tools at site #37-6-1612 and #37-6-1614, demonstrating a possible heavy duty use activity such as woodworking;
- Cores are present in assemblages from site #37-6-1611, #37-6-1613 and #37-6-1614;
- The size range of intact flakes at site #37-6-1611 and #37-6-1614 is similar, but #37-6-1611 is marked by the presence of very small flakes; and
- Angular fragments recovered from site #37-6-1614 may show a tendency to be larger than those from #37-6-1611.

In conclusion, HLA 2007 determined that:

- The recorded artefacts have undergone a high degree of taphonomic movement. Haul Road 1 (the current Area 4) revealed that artefacts were being leached and eroded from the vertical sections of the scour and moved downslope towards Wollombi Brook;
- Haul Road 1 contains potential subsurface deposits;
- Haul Road 1 indicates several repeat visits to this area by Aboriginal/s. The site's location near water sources suggest they were resting areas utilised predominantly for water and its resources; and
- Assemblage composition reveals that the site is most likely at most of mid-Holocene age. This is inferred from the presence of backed blades.

The recovered assemblage from Area 4 agrees with the HLA 2007 findings in general terms although the smaller sample size of the current investigation that does not include surface artefacts limits meaningful comparisons. However, with reference to the HLA 2007 findings:

- Area 4 recorded 56 artefacts from subsurface contexts although surface artefacts were more numerous and the findings agree with HLA 2007's assertion that Haul Road 1 'is a large site';
- Almost all (93 per cent) of the artefacts recorded in the excavations at Area 4 were silcrete. It is not known if HLA 2007 regard silcrete as 'sedimentary' but this is a possible contradiction with HLA 2007's findings;
- The tool and core types recorded by HLA 2007 are representative of those recorded at Area 4 although no hammerstones or large core-tools were recorded;

- The average artefact size at Area 4 was between size ranges 2 and 3 (i.e. from 10mm to 30mm). This agrees with HLA 2007's findings of mean flake length (24.1mm) and mean flake width (19.33mm) from site #37-6-1611; and
- The subsurface investigations at Area 4 agree with the general conclusions of HLA 2007 concerning taphonomic movement, past settlement use and chronology. While the current investigation noted that there are subsurface deposits at Area 4, it showed these deposits are isolated and separated by areas demonstrating a very low artefact density.

Insite Heritage 2010b

By way of contrast, Insite Heritage in 2009 carried out further salvage work in the vicinity of Area 4 (2010b). The surface collection component recorded 35 artefacts: 10 broken flakes (eight mudstone and two silcrete), 18 flakes (14 mudstone, two silcrete, one chert and one volcanic), six cores (five mudstone and one silcrete) and one silcrete broken core, and three angular fragments of silcrete. This surface collection assemblage stands in marked contrast to the predominance of silcrete recorded in the current program.

Following the surface collection Insite Heritage excavated a number of transects located to the east of the current excavation squares at Area 4. The closest Insite Heritage transect, Transect I, was located within 20m of Area 4 Tr4. At Transect I, Insite Heritage excavated two open area excavations totalling over 32m^2 with one excavation totalling 13.75m^2 and the other 19m^2. 613 artefacts were recorded from these excavations.

Results of the 2009 Insite Heritage investigations can be summarised:

- In the subsurface excavations 51 per cent of artefacts were silcrete while 38 per cent were mudstone. There were several chert artefacts (seven per cent) and a small number of quartz, petrified wood and volcanic artefacts represented;
- Flakes were the most common artefact type (59 per cent) followed by broken flakes (38 per cent). Small numbers of cores (one per cent of the assemblage), flaked pieces and six 'implements' (i.e. backed blades/flakes) were also recorded;
- A greater variety of raw material types was recorded in the subsurface assemblage, though this may simply be a reflection of the greater quantity of artefacts recovered;
- Surface salvage and excavation works undertaken for the Life of Mine Emplacement Area (LOMEA; located 2km northwest of Area 4), also identified the dominant raw material type from the surface collection of artefacts at site #37-5-0073 (Red Bank Creek 57) was mudstone 77 per cent, with silcrete (50 per cent) being the dominant raw material type of the subsurface artefacts followed by mudstone (36 per cent) (Insite Heritage 2010a);
- The investigations undertaken by Koettig and Hughes (1983) noted that a higher proportion of backed artefacts were mudstone as opposed to silcrete. This was also the case for the small number of implements recovered from the investigations undertaken for the LOMEA. This, however, was not the case for the six backed artefacts recovered from Area 4 of which three were silcrete, two mudstone and one chert;

- The presence of backed artefacts in the assemblage dates the site to the last 5000 years BP (Koettig & Hughes 1983);
- The majority of both the surface and subsurface flakes recovered from adjacent to Area 4 were less than 50mm in length. This was also the case for the artefacts salvaged by other archaeological salvage works conducted within United Collieries Lease Area;
- The small number of cores in the assemblage may be the result of either flakes being transported into the area, or the larger primary flakes and cores being removed to another location. Hammerstones, anvils and ground edge axes were also absent; and
- The artefacts recovered from the subsurface excavation works were located within the shallow A Horizon soils.

Like the work by Insite Heritage, the current test excavation program, although more limited in extent, revealed similar attributes, namely:

- All artefacts were recorded in shallow A Horizon soils;
- Silcrete was the dominant raw material;
- The one backed blade and the three cores recorded at Area 4 were of silcrete;
- Artefacts from Area 4 averaged less than 30mm in size;
- Average artefact density at Insite Heritage's Transect I was 4.4 artefacts per 0.5m by 0.5m excavation square. By contrast Area 4 Tr4 had an average artefact density per 0.5m by 0.5m excavation square of 9.5; although this transect had the highest artefact density at Area 4. Tr2, for example, had an average of two artefacts per excavation square and Tr3 had an average of 0.4 artefacts per excavation square. This indicates a high artefact density variability from location to location.
- Hammerstones, anvils and ground edge axes were also absent; and
- Unmodified flakes were the most common artefact type present.

8.2.1 Research considerations

It was noted in **Section 7.3.2** that there are three considerations when it comes to assessing the research potential of any given assemblage.

As noted, apart from a few notable exceptions discussed above, the remainder of the excavation squares did not produce artefacts in sufficient quantities so as to form a statistically useful sample size. Even the combined assemblage of 192 artefacts is hardly a large sample size and, as it spread over six locations separated by up to three kilometres, it cannot be considered a single assemblage.

When considering condition, as noted above, there are small areas where *in situ* deposits have been identified. However, as noted by Koettig and Hughes in 1983 (**Section 4.4.3**) and during the current assessment (**Section 3.7.3**), there have been widespread disturbances across the

Survey Area in the form of vegetation clearing, erosion, ploughing, past archaeological salvage, farm infrastructure and mining activities. As a result, the condition of subsurface deposits are generally poor and are likely to have been disturbed in the past.

Due to the small sample size and the limited information it can provide, the recording of artefacts has been limited and not at the level typified by studies such as Hiscock 1984. The recording regime is considered sufficient to determine basic artefact characteristics and to identify any gross differences between excavation areas. As a result, the level of theorising applicable to such a study is limited as the data set is not robust or large enough to justify a finer examination that could allow broader theories to emerge.

In **Section 4.5.2** five models were set forward to be tested during the assessment and these will be dealt with individually below.

Site location model

This model aimed to test the established paradigm of a close association of occupation evidence to water resources. The limited results from the test excavation and geoarchaeological auger programs supported this model as all evidence for occupation occurred close to water resources. Although the geoarchaeological auger program tested landforms distant to water, no evidence was forthcoming to suggest that these landforms contained undetected sites.

Site type model

This model aimed to test the established paradigm that the majority of sites consist of artefact scatters or single artefacts. As noted in **Section 8.1.2** the survey confirmed this model and the test excavation program produced no evidence to the contrary.

Site distribution model

This model aimed to test the observation that sites in the Survey Area consist of clusters of artefacts separated by areas of low artefact density. Although the results of the test excavation program were limited, the results did confirm this model as the two concentrations of artefacts recorded were isolated within areas of extremely low artefact densities. This result supports the findings of previous investigations that occupation within the Survey Area was neither long-term nor frequent as this would have led to a blurring of site boundaries and a more-continuous distribution of artefacts along features such as waterways. See **Section 4.5.2.3** for a discussion of this model and the implications to our understanding of the nature of occupation in the Survey Area.

Site condition model

This model aimed to test whether degrading and aggrading landforms preserve sites in varying ways. The test excavation program, as well as the geoarchaeological auger program, confirmed that there are few areas of aggrading landforms within the Survey Area. Both instances of buried

soil layers noted during the survey were investigated and neither were extensive indicating a localised phenomenon rather than a wide-spread occurrence. Test pits adjacent to waterways routinely displayed thin, undifferentiated sandy loams, often very leached, on top of the B Horizon clays. Very few test pit locations provided evidence of aggradation. Rather, the conclusion was that the entire landscape, apart from one or two pockets, is degrading and even test pits adjacent to waterways, or auger locations on floodplains, displayed thin A Horizon soil layers and no evidence of buried A Horizon layers. The only exception to this was in Test Excavation Area 6 where deposits on the northern bank of Redbank Creek were thick alluvial deposits. However, no sites were recorded associated with this area. Therefore, as the majority of the Survey Area is in a degrading environment, this model was not able to be tested as these landforms could not be compared to aggrading landforms.

Chronological model

This model aimed to test the established paradigm that most sites date to the late Holocene epoch and that Pleistocene sites are extremely rare, if not non-existent. The test excavation program confirmed this model as no evidence of non-Holocene occupation was forthcoming. Although the B Horizon was tested during both the test excavation and geoarchaeological auger program, there was no indication that the B Horizon soils contained evidence of Pleistocene occupation. This confirms the regional paradigm that Pleistocene deposits have either been removed as a result of increased rainfall during the Holocene, or as is more-likely the case, are very rare as climatic conditions during the Pleistocene did not encourage occupation of more-marginal areas as exemplified by the Survey Area, or if they had been occupied, the lower population levels during the Pleistocene were such that evidence of such occupation is very rare in open site contexts.

8.2.2 Conclusion

The following observations concerning subsurface deposits within the Survey Area, based on the test excavation program and auxiliary research, can be made:

- The Survey Area exhibits a generally low artefact subsurface density;
- There do remain a few isolated examples of *in situ* subsurface deposits;
- Past Aboriginal occupation of the area was focused on Redbank Creek and, to a lesser degree, other waterways;
- Past Aboriginal occupation appears to have been either short-term or sporadic/seasonal as large conurbations of artefact scatters are absent. It is assumed the more-reliable water of the Wollombi Brook would have provided the resources necessary to encourage longer-term occupation and that environments, such as that along Redbank Creek, would have been used either as transit camps or for seasonal resource procurement and/or less intensive land management activities.

- There has been a long history of disturbance to the Survey Area which has very likely impacted the archaeological record;
- There is almost no correlation between visible surface artefacts and subsurface deposits. Where large numbers of surface artefacts are visible there will be no associated subsurface deposits and where there are no surface artefacts visible there is the possibility, in some areas, of subsurface deposits;
- The visible surface artefacts are in secondary contexts: they are either the remnants of sites that have completely eroded away or they have been redeposited at their current location by water movement. All artefacts would have originated from nearby landforms but their precise depositional context cannot be determined;
- The artefact type, the frequency of artefact types and the use of raw materials recorded within the Survey Area is representative of recordings elsewhere in the Hunter Valley and from earlier investigations within the Survey Area;
- Almost all artefacts were recorded in the top-most 15cm of the A Horizon;
- There was a high degree of artefact breakage which may be an indication of past disturbances in the Survey Area;
- Generally, whether mudstone or silcrete, one raw material clearly predominated at each excavation area. This lack of variety also points to one-off activities having taken place at sites rather than sites being used over extended periods which would have produced a greater variety of tool types and raw materials;
- The great majority of artefacts were without cortex (tertiary reduction stage) indicating either that most artefacts were brought into the area and that only re-fashioning/re-sharpening occurred in the Survey Area, or that artefacts were produced in the area (as is evidenced by the few recorded concentrations) but from cores already reduced to a stage where the cortex had been removed;
- The proportion of cores within the assemblage (3-5%) confirms with previous studies. All cores utilised multiple platforms (multidirectional cores) and the majority had no cortex although some had a high degree of cortex indicating that primary reduction of cores, mostly from river cobbles, was taking place at a low level;
- An attempt was made to recognise Hiscock's RAS within the artefact assemblage but this was unsuccessful. There were few large flakes in the artefact assemblage as predicated by phases 1–4 of RAS (**Section 4.4.3**; see also discussion on the size of recorded artefacts **Section 7.4.2.5** which shows that less than two per cent of recorded artefacts are larger than 50mm) and the distinctive removal of elongate flakes from the margins of these large flakes was not noted. It is accepted that the recorded elongate flakes could have been produced by RAS elsewhere and were transported into the area. However, faceted platforms are a hallmark of the elongated flakes produced by RAS (Hiscock 1993: 68) and these are rare in the artefact assemblage. Of the 79 artefacts with platforms preserved, 60 (76 per cent) have simple platforms (this descriptor is reasonably unambiguous and describes a platform without cortex and without any faceting or working of any kind: often where a previous flake scar has been used as a platform) and only one artefact was recorded as having a faceted platform. While it is accepted that the small sample size may have influenced results, the indication from the current program is that

RAS is: relatively rare; or very difficult to recognise; and/or its recognition requires a level of analysis that is beyond this work;

- Backed artefacts are representative of those recorded elsewhere although no microliths were recorded. In agreement with Hiscock's observation (**Section 4.4.3**) that backed blades are almost exclusively produced on an anvil, most of the backed blades showed signs of crushing on the margin opposite the point of percussion for retouch flake removal indicating the use of an anvil. Reduction was most commonly by pressure flaking, although in one example (Area 6 Tr3 Sq5), tranchet reduction is possible;
- The recorded artefacts are likely to date to the Holocene epoch and most probably to the most-recent 4,000 years; and
- There is very limited research potential remaining within the Survey Area and overall the Survey Area exhibits low scientific values.

9 ASSESSMENT OF SCIENTIFIC SIGNIFICANCE

9.1 PREAMBLE

The deep connection some RAPs and Wonnarua knowledge holders have for the Survey Area is acknowledged. Also acknowledged is archaeology's role in further diminishing the cultural landscape through activities such as archaeological salvage that is seen with great regret by many in the Aboriginal community. It is also accepted that while archaeology focuses on the tangible remains of Aboriginal occupation that other aspects such as the area's plants and animals, the landscape itself and associations to both sacred and secular features are equally important. However these aspects lie somewhat outside of an assessment of the area's scientific values such as is contained in this report. The overarching ACHA will deal with some, or all, of these accompanying values.

It is also accepted that the archaeological value of the Survey Area has been diminished by over 34 years of archaeological work that has focused on the impacts of particular developments rather than considering the entire area in a holistic way. This archaeological work has resulted in some areas being cleared of surface artefacts and other areas excavated with each project remaining bound by the particular proposed impact at that time. This has led to a fragmented archaeological landscape and one today that does not display the full context of the area's archaeological potential.

When looking at the larger-scale impacts within the Survey Area it becomes obvious that mining has not been the major contributor to the dislocation of the archaeological landscape. As has been demonstrated previously, European farming practices have resulted in far more damage to archaeological contexts than the advent of mining. The clearing of the land and stocking the land beyond a sustainable carrying capacity has led to widespread soil loss, stream incision and stream-bank erosion. This has resulted in a severe impact to archaeological deposits and potentially the removal of entire site types such as culturally scarred trees. This is not to dismiss the obvious impact mining could have on the surviving archaeological landscape but it would be wrong to say that the proposed mining in the Survey Area is impacting a surviving, intact archaeological landscape.

9.2 THE ASSESSMENT OF CULTURAL HERITAGE SIGNIFICANCE

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Social, Scientific, Aesthetic and Historic significance are identified as baseline elements of significance assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Social or Cultural value

This area of assessment concerns the importance of a site or features to the relevant cultural group: in this case the RAPs. Aspects of social value include assessment of sites, items and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa. This value will be assessed in the ACHA.

Scientific value

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of value relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current research also involves defining 'research potential' and 'representativeness'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region? This criterion will be assessed in this report. It is noteworthy that this criterion has been further informed by the results of a test excavation programme at some locations and hence is not based solely on surface manifestations or previous sub-surface archaeological investigations.

Aesthetic value

This refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use (ICOMOS 1988). This value will be assessed in the ACHA.

Historic value

Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have ‘shared’ historic values with other (non-Aboriginal) communities.

Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage. Consequently the Aboriginal involvement and contribution to important

regional historical themes is often missing from accepted historical narratives. This means it is often necessary to collect oral histories along with archival or documentary research to gain a sufficient understanding of historic values. This value will be assessed in the ACHA.

9.3 BACKGROUND TO THE ASSESSMENT OF SCIENTIFIC SIGNIFICANCE

This assessment only refers to sites within the Survey Area and not to the Project Area as a whole. It is understood that there are areas within the Approved Disturbance Area for Wambo that contain many sites but assessment of these sites is in the Wambo EIS and disturbance to these sites has been previously consented.

This assessment has considered all levels of archaeological significance, including high scientific significance, but due to the reasons set out in **Section 9.4.1**, no site has been assessed has having high or moderate scientific significance. Consequently, this assessment will use the following terms to characterise sites:

- Low-Moderate Scientific Significance or low-moderate archaeological values; and
- Low Scientific Significance or low archaeological values.

Portions of the Survey Area have also been designated as having no scientific significance or no archaeological potential due to the high degree of past disturbance that has occurred in some locations. This is not to say that there are not artefacts in these areas but that these artefacts are in secondary contexts within modified landforms that have no potential to have intact subsurface deposits. Very little new information could be gleaned from the study of these artefacts as they have lost all contextual association.

This hierarchy is used to categorise the archaeological landscape of the Survey Area based, in this report, on the assessed scientific or archaeological values of a particular location.

This is not to say that the author is unaware of possible social / cultural, aesthetic and historic values at a particular location, but the assessment here is of the scientific values alone while the other values will be examined in the broader ACHA.

In terms of scientific significance, locations will primarily be assessed on their ability to add reliable archaeological information which can further our understanding of the archaeology at a local and regional level or a site type's rarity within the landscape. This assessment has been informed through surface observations/survey, sub-surface archaeological testing and review of previous site specific reports.

Considerations taken in this scientific assessment include an understanding that a part of the archaeological value of a place is the general community's association to that place. This is often distinct from the Social, Aesthetic and Historic criteria used to assess heritage significance as it relates to a person's relationship to the archaeology of the place. For the Aboriginal participants

on the survey, for example, an archaeological site was appreciated as much for its archaeological values as it was for its cultural values. A site displaying either a large number of artefacts or a number of interesting artefacts would engender fascination and discussion on purely archaeological grounds (Where did people live / eat? How did they live? How did they use the artefact and what does it tell us about the people who made it?).

It is therefore understood that many Aboriginal people, or people generally interested in pre-history, would see the sites recorded in this assessment to have higher archaeological values than may be given in this assessment. However, this assessment has attempted to distinguish between an artefact scatter with potential to yield further information (low–moderate scientific significance) and an artefact scatter in a completely eroded context that would yield little meaningful further information (low scientific significance).

Based on the findings of the survey, test excavation and auger programs, and mindful of the high level of disturbance across the Survey Area, the following criteria are taken into account when assessing scientific significance:

Low–Moderate Scientific Significance

Sites displaying these values would include one or more of the following features:

- The location would contain areas of archaeological deposits, sometimes disturbed, that are likely to add to our knowledge about the Aboriginal archaeology of the local area only.
- Would contain archaeological information to address general research questions about the region.
- The site contains features that would be appreciated by a specialist / enthusiast.
- Portions of the site have been lost due to erosion or the landscape context of the site has been impacted.

Low Scientific Significance

Sites displaying these values would include one or more of the following features:

- The location may contain areas of archaeological deposits but they are likely to be disturbed and any information gained would only address limited research questions.
- The site is largely displaced by erosion.
- The landscape context of the site has been heavily modified.
- The site exists in areas where A Horizon soil loss is extensive.
- The site contains features that would be difficult to interpret in a meaningful way.

9.4 ASSESSMENT OF SCIENTIFIC SIGNIFICANCE

9.4.1 Background

The current assessment of the Survey Area has recorded 25 artefact scatters, 34 isolated finds and 20 extensions to previously recorded sites (all artefact scatters). Within the site extensions are a further nine previously recorded sites that have been subsumed into the larger site area.

In addition, there are a further 49 sites listed on AHIMS as valid or partially destroyed. Of these 49 sites, 36 (73 per cent) are listed as artefact scatters, 11 (22 per cent) as isolated finds and two as PADs.

Therefore, in total, this assessment considers 128 sites.

While the assessment of scientific significance to the newly recorded sites is straight-forward, this is not the case with many of the previously recorded sites. For example 13 (or 26.5 per cent) of the previously recorded sites outside of 2015 site designations were recorded by Margit Koettig and Phillip Hughes in the early 1980s. At this time it was not the practice to assign significance values to sites. While the survey attempted to locate all previously recorded sites in order to determine significance this was rarely successful given the length of time that has passed since the site's recording and the fact that the AHIMS coordinates are only approximate and that the original recordings were located by means of topographic maps. Subsequent to the survey, OzArk has done much research to try and rectify the AHIMS location of sites which were particularly inaccurate within the Survey Area. As a result of this research of the original reports and site cards, it had to be accepted that the precise location of many previously recorded sites within the Survey Area will never be known beyond assuming that they were somewhere within a general area. Therefore the significance of many previously recorded sites will be done on the basis of an assessment of the general landforms in which they were located rather than on information from the exact site itself.

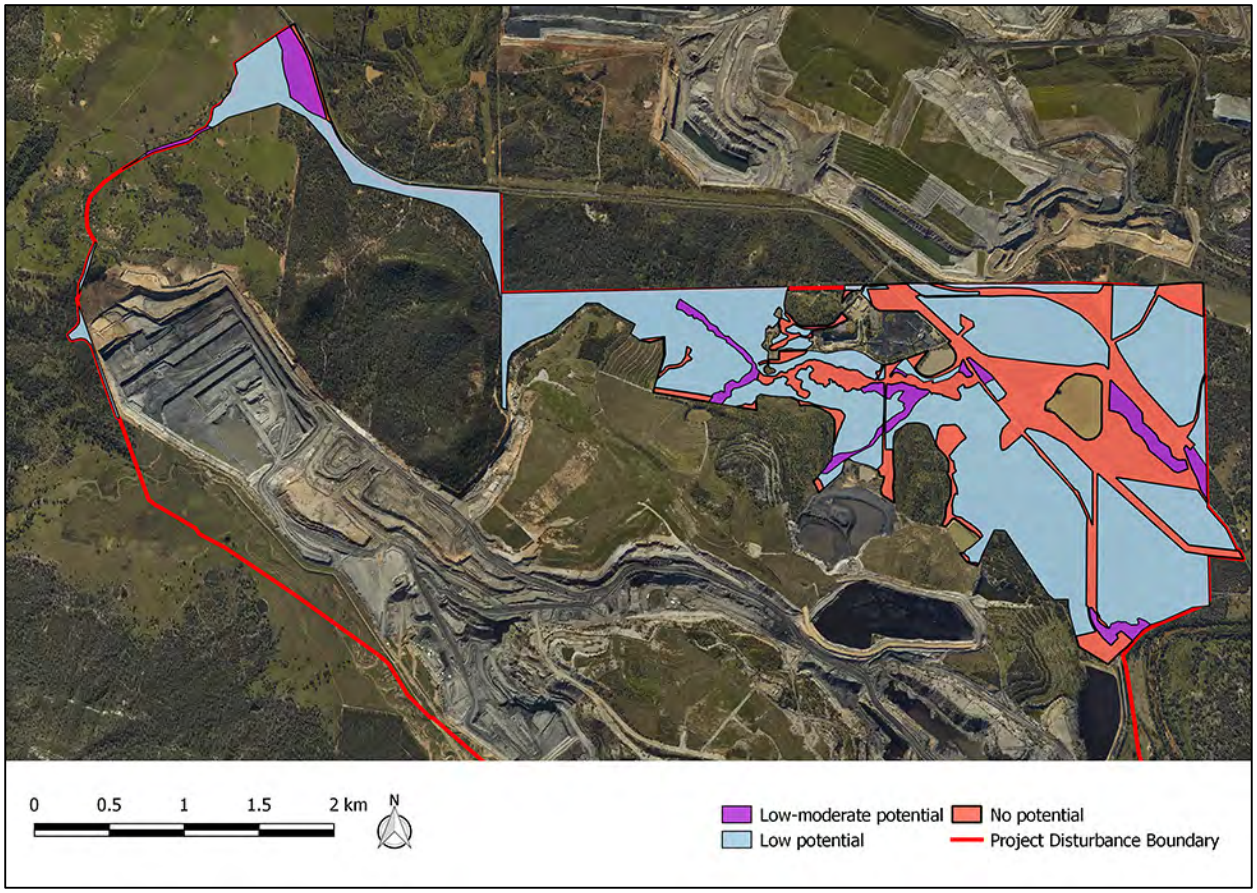
In short, as these recordings span 34 years and on-going erosion and deposition have continued through this time, it would be a near impossible task to identify each of these sites in the field and complete a separate scientific significance for each site. Instead the approach here will be to group any previously recorded sites and apply an overall scientific significance to the landform as a whole. This overall assessment of scientific significance would then apply to any previously recorded sites within that area. This generalised approach has been cross-referenced to more recent reports (such as Insite Heritage 2010b: 19) where assessments of significance are provided (albeit for sites now salvaged) to ensure that the levels of significance afforded here generally agree with that of previous researchers.

Based on the results of the survey and the test excavation and auger program, as well as background research including georeferenced historical aerial photos, the Survey Area can be

mapped for archaeological potential (**Figure 9–1**: this figure only assesses the Survey Area. Other areas within the Project Area have existing disturbance, infrastructure or approved mining operations). This shows large areas of the Survey Area having 'no potential' where it can be clearly demonstrated that the landforms have been modified by mining activity, widespread erosion or cropping to the extent that intact archaeological deposits are highly unlikely. Other large areas have been mapped as 'low potential'. These areas are outside of the modified landforms identified as having 'no potential' but are in landforms where soils tend to be thin or in landforms that are distant from water making sites within them likely to be smaller and less complex (and hence less significant) than sites closer to water. Small areas of the Survey Area are mapped as having low–moderate archaeological potential. These areas tend to include landforms that are not heavily disturbed but are closer to water resources.

The mapping of the Survey Area's archaeological potential will be used to determine the current scientific significance of previously recorded sites as mentioned above.

Figure 9-1. Archaeological potential of the Survey Area.



Although the assessment of significance is obviously a subjective task, the use of the guidelines established in **Section 9.3**, enables a reasonable standard of objectivity, or at least a criterion-based standard of assessment.

The overall scientific significance of sites within the Survey Area has been lowered due to:

- wide-spread gully erosion and soil loss that affects nearly all portions of the Survey Area;
- major disturbances from approved mining activity including roads, dams, drill pad, bulldozed landforms, creek engineering, bund construction and other infrastructure;
- a relatively dense array of farm and civil related infrastructure such as dams, roads, and other features such as electricity lines;
- the archaeological landscape within the Survey Area being fragmented between these disturbances; and
- the varying degrees of archaeological salvage that has been undertaken within the Survey Area.

As a result, no sites are assessed to have high or moderate scientific significance.

As all sites within the Survey Area are either low density artefact scatters or isolated and/or are located in landforms with depleted A Horizon soils and invasive erosion (to varying degrees), they have been assessed as holding low–moderate scientific significance or less.

The majority of sites (n=122; 95 per cent of all 128 sites) have been assessed as having low scientific significance. In most cases this is because the sites are low density artefact scatters or isolated finds located in landforms with thin A Horizon soils where further subsurface archaeological deposits are unlikely. In some cases the artefacts may be more numerous but erosion has affected a large percentage of the site and the visible artefacts are displaced and of limited archaeological value.

The high frequency of low scientific significance is directly related to the extensive and long-running previous disturbances within the Survey Area as was summarised in **Section 3.7**.

9.4.2 Assessment of Scientific significance

Table 9–1 assesses the scientific significance of the newly recorded artefact scatters and isolated finds. Under the column ‘Reasons’ a brief explanation is given of those site features that elevate or lower a particular site’s scientific significance.

Table 9–2 assesses the scientific significance of all amended previously recorded sites.

Table 9-1. Scientific significance of newly recorded sites.

Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
United OS-1	307834E 6398781N	Low	The site today represents an eroded surface scatter of low density artefacts. The site has undergone impacts from agricultural land use and erosion. Shallow A Horizon soil depth present. Soil depth tested during auger program: Auger Location 9. Area retains some archaeological potential although the likelihood of there being intact subsurface deposits is low.
United OS-2	308228E 6398037N	Low	The site today is located either side of an eroding ephemeral gully in an area of densely regenerating woodland. No A Horizon soil depth present. Likely artefacts are in a secondary context.

Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
United OS-3	309228E 6397244N	Low	The site represents an eroded surface scatter of low density artefacts. The site has undergone impacts from agricultural land use and erosion. No A Horizon soil depth present. Likely artefacts are in a secondary context.
United OS-4	309411E 6397262N	Low	Site represents an eroded surface scatter of low density artefacts. The site has undergone impacts from agricultural land use and sheet wash erosion. No A Horizon soil depth present. Likely artefacts are in a secondary context.
United OS-5	309931E 6397262N	Low	The site has undergone impacts from agricultural land use and erosion. No A Horizon soil depth present. Likely artefacts are in a secondary context.
United OS-6	310432E 6397137N	Low	The site is within a gully which has been subject to extensive erosion where a large percentage of artefacts are displaced. Thin A Horizon soil depth is present. Soil depth tested during auger program: Auger Location 1.
United OS-7	311135E 6396836N	Low	The site displays a number of exposures resultant from mining activities, agricultural activities and erosion. A Horizon soil depth is present in places but is known not to contain intact subsurface deposits. Subsurface deposits tested during test excavation program: Area 1 and Area 5 that yielded a very low artefact count.
United OS-8	311357E 6396100N	Low	Previous archaeological salvage has taken place within site boundary (AHIMS site #37-5-0075: Red Bank Creek 59). The site has been subject to in-stream gully erosion. Little A Horizon soil depth is present.
United OS-9	311438E 6396092N	Low	The site contains a number of very small exposures and has undergone impacts from erosion and nearby mining related activities. A Horizon soil depth is present in places but is very thin.
United OS-10	311646E 6396285N	Low	The site contains a small exposure where all the A Horizon soils have been removed as a result of erosional processes. Very low artefact density.
United OS-11	312373E 6396137N	Low	The site is a surface scatter of low density artefacts. The site has undergone a high level of disturbances from agricultural land use and is surrounded by regenerating woodland. Limited A Horizon soils are present.
United OS-12	312620E 6396290N	Low	The site has undergone impacts from agricultural land use and erosion. No A Horizon soil depth is present and gravels are exposed on the surface. Previous archaeological salvage has taken place within the site's boundaries: AHIMS #37-6-1910 (United Collieries 3 [Singleton]); AHIMS #37-6-1614 (Haul Road 6) and AHIMS #37-6-1921 (United Collieries 21 [Singleton]) have all been salvaged in the past.
United OS-13	312378E 6396843N	Low	The site is located within a cleared easement with modern rubbish within a nearby gully. The site has undergone impacts from infrastructure constructions and agricultural land use. A Horizon soil depth is limited.
United OS-14	313027E 6396942N	Low	The site is located within an exposed area containing imported gravels. The site has undergone impacts from the installation of mining related infrastructure. No A Horizon soil depth is present. Very low density artefact scatter.
United OS-15	312861E 6395961N	Low	The site is low density surface artefact scatter along an access track with exposed gravels. The site has undergone impacts from mining related activities such as road construction and stockpiling as well as erosion. No A Horizon soils are present.

Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
United OS-16	312859E 6396231N	Low	The site is a low density artefact scatter visible in a moderately sized exposure that has been subject to erosion. No A Horizon soils are present. Site is located on the south east bank of a spillway and the recorded artefacts are in a secondary context. There has also been previous archaeological salvage in the vicinity (AHIMS #37-6-1613; Haul Road 5).
United OS-17	313004E 6395356N	Low	The site is low density surface artefact scatter along an access track with exposed gravels the site has undergone impacts from erosion. No A Horizon soils are present. There has also been previous archaeological salvage in the vicinity (AHIMS #37-6-1020; UNITED site 2).
United OS-18	313204E 6395068N	Low–moderate	The site is a low to moderate density artefact scatter visible within an eroded drainage line. Site has been disturbed by sheet wash erosion and mine related infrastructure with an electricity easement running through the north west of the site. A Horizon soils are present in places. This site was tested during the test excavation program (Area 4) and while there was generally a very low subsurface artefact density there were one or two pockets of *in situ* deposits.
United OS-19	313129E 6394943N	Low	The site has undergone impacts from mining infrastructure and mine related activities with buried pipelines, tracks, dams, bunds and set down areas present. A Horizon soils are present in places, largely within the northern portion of the site although this area has undergone previous archaeological salvage (AHIMS #37-6-1010 [UC5/1]).
United OS-20	313344E 6395141N	Low	With only two artefacts recorded, United OS-20 represents a very low artefact density scatter. A Horizon soils have been lost from across the area and the A Horizon is estimated to be thin.
United OS-21	313641E 6395164N	Low	With only two artefacts recorded, United OS-20 represents a very low artefact density scatter. A Horizon soils have been lost from across the area and the A Horizon is estimated to be thin. Archaeological salvage has taken place in the vicinity (AHIMS #37-6-1923 [United Collieries 24 (Singleton)].
United OS-22	313521E 6396083N	Low	The site is located on farm dam wall and all artefacts are in a secondary context.
United OS-23	313585E 6396001N	Low	Very low density artefact scatter located along an access track The site has undergone impacts from erosion and from the construction and use of the access track. Artefacts are likely to be in a secondary context.
United OS-24	313762E 6395944N	Low	The low density artefact scatter is located along an access track. No A Horizon soil are present. Very low density artefact scatter.
United OS-25	313508E 6396284N	Low–moderate	The low density artefact scatter is present adjacent to land than has been cropped in the past. A Horizon soils are present within densely regenerating Casuarinas. Site tested during the test excavation program (Area 6) which demonstrated a low density of subsurface artefacts.
United IF-1	306963E, 6398215N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-2	307034E, 6398216N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-3	307283E, 6398374N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-4	308042E, 6398409N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-5	306437E, 6396944N	Low	No associated subsurface deposits as A Horizon soil depth is limited.

Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
United IF-6	306724E, 6396397N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-7	309192E, 6396998N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-8	309356E, 6397070N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-9	310119E, 6397274N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-10	311776E, 6396718N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-11	312296E, 6395887N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-12	312436E, 6395857N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-13	312524E, 6396079N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-14	312571E, 6395769N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-15	312184E, 6397195N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-16	312478E, 6397253N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-17	312703E, 6397015N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-18	312603E, 6396745N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-19	312734E, 6396857N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-20	313145E, 6396866N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-21	313267E, 6396982N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-22	312874E, 6395349N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-23	313073E, 6395177N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-24	313365E, 6394924N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-25	313190E, 6395321N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-26	313431E, 6395020N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-27	313418E, 6395092N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-28	313494E, 6395072N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-29	313519E, 6395238N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-30	313283E, 6396158N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-31	313313E, 6396222N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-32	313645E, 6395904N	Low	No associated subsurface deposits as A Horizon soil depth is limited.

Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
United IF-33	313699E, 6396061N	Low	No associated subsurface deposits as A Horizon soil depth is limited.
United IF-34	313828E, 6396242N	Low	No associated subsurface deposits as A Horizon soil depth is limited.

Table 9-2. Significance assessment for all amended previously recorded sites.

AHIMS ID	Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
#37-5-0025	Agip 2 Malabar	311455E, 6396668N	Low	Agip 2 Malabar consists of more than one hundred artefacts on series of erosion scalds between the parallel watercourses of Redbank Creek and an anabranch. Tested during the test excavation program (Area 2) which revealed almost no subsurface artefacts in adjoining landforms. Therefore all visible artefacts are in secondary contexts.
#37-5-0028	Malabar Agip 3	310305E, 6396790N	Low	Malabar Agip 3 is within an artificial drainage line. Only a single artefact was recorded during the survey and it is likely to be in a secondary context.
#37-5-0096	Red Bank Creek 28	310742E, 6396601N	Low–moderate	Red Bank Creek 28 consists of more than ten artefacts located within an eroding area that has previously been ploughed. The site encompasses previously recorded AHIMS site #37-5-0027 (Malabar). The site was investigated by the auger program (Auger Location 7) which demonstrated that the soils to the north of the site consist primarily of clay and that the A Horizon within the site is very thin. The low–moderate significance is more applicable to the western portions of the site rather than the eastern portions.
#37-5-0099	Red Bank Creek 31	310921E, 6396810N	Low	Red Bank Creek 31 was recorded along an artificial bund in an area of high general disturbance. Site encompasses previously recorded AHIMS site #37-5-0577 (UCL 12-2).
#37-5-0100	Red Bank Creek 32	310973E, 6396755N	Low	Red Bank Creek 32 was recorded along an artificial bund in an area of high general disturbance including erosion surrounding an old farm crossing of Redbank Creek. Test Excavation Area 1 Tr1 was located within the site boundaries and recorded a very low artefact density.
#37-5-0110	Red Bank Creek 15	311701E, 6396723N	Low	Red Bank Creek 15 consists of five artefacts recorded along an artificial drainage channel. The low density artefact scatter is diffused and due to the high local disturbance artefacts are in a secondary context.

AHIMS ID	Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
#37-5-0115	Red Bank Creek 8	312119E, 6396619N	Low	Red Bank Creek 8 consists of more than eighty artefacts recorded within a number of large exposures. The new site boundary of Red Bank Creek 8 encompasses AHIMS sites #37-5-0023 (Warkworth Agip 8) and #37-5-0512 (United Collieries 13). The site was investigated during the test excavation program (Area 3) which showed that there were almost no subsurface artefacts within the site. Subsequent research shows that this area has been heavily modified by the building of Dam 2 and associated drainage works.
#37-5-0116	Red Bank Creek 5	311209E, 6396747N	Low–moderate	Red Bank Creek 5 consists of more than 120 artefacts recorded within a number of large exposures. The site was investigated during the test excavation program (Area 2 Tr1, Tr2, Tr6, Tr7, Tr8 and Tr9) which showed that there remain pockets of *in situ* subsurface deposits although these deposits are isolated by areas of very low artefact density.
#37-5-0343	Wambo 202	308850E, 6397962N	Low	Wambo 202 consists of two artefacts recorded within an eroding gully on a lower-slope landform. Very thin A Horizon soils.
#37-5-0349	Wambo 190	309204E, 6397081N	Low	Wambo 190 consists of four artefacts located in an upper-slope landform. The artefacts are visible along an access track that has been previously bulldozed. Very thin A Horizon soils.
#37-5-0520	United Collieries 23	312357E, 6396285N	Low	United Collieries 23 consists of more than thirty artefacts visible along an access track to the east of Dam 3. The new site boundaries encompass site #37-5-0518 (United Collieries 2). The site was extensively investigated by the auger program (Auger Location 4) which showed that there is very thin A Horizon soils remaining on the sloping landform. Artefacts are likely to be in a secondary context.
#37-5-0523	United 6	311879E, 6396514N	Low	United 6 consists of more than thirty artefacts visible along an access track on previously cultivated land. The site was investigated by the auger program (Auger Location 3) which showed the creek flats on either side of the minor drainage line that bisects United 6 (a north flowing tributary to Redbank Creek) have a heavy clay content and little archaeological potential.
#37-5-0576	UCL 12-1	310477E, 6396730N	Low	UC12-1 consists of more than fifteen artefacts recorded within small exposures in a generally cleared landscape (with some pockets of regenerating trees). Thin A Horizon soils.

AHIMS ID	Site Name	Location (GDA94 Zone 56)	Scientific significance	Reasons
#37-6-0325	Red Bank Creek 47	312878E, 6396647N	Low	Red Bank Creek 47 consists of more than thirty artefacts visible within areas of exposure to the west of Dam 1 and along the eroding banks of Redbank Creek. The site area has been highly modified in the past and is subject to inundation from water in Dam 1. Site encompasses AHIMS site #37-6-0323 Red Bank Creek 45).
#37-6-0326	Red Bank Creek 48	312627E, 6396551N	Low	Red Bank Creek 48 consists of a single artefact in a landform that was highly modified during the construction of Dam 1.
#37-6-1033	UC2/1	313323E, 6396475N	Low–moderate	UC2/1 consists of more than twenty-five artefacts located to the east of Dam 1. The site has varying archaeological potential and it is possible that there are isolated areas of *in situ* deposits on the western bank of Redbank Creek. The eastern bank has little potential. The site was investigated by the auger program (Auger Location 5) which revealed leached A Horizon soils (indicating potential aggrading events) to 20cm in places. Site also includes #37-6-0131 (Agip 6 Warkworth) and #37-6-0275 (Red Bank Creek 10).
#37-6-1777	146	313461E, 6396646N	Low	Consists of more than fifteen artefacts that are visible along a large exposure within an electricity easement. Thin A Horizon soils present.
#37-6-1912	United Collieries 5	312882E, 6396331N	Low	United Collieries 5 consists of more than fifty artefacts recorded along an artificial drainage channel within a highly modified landform. Site encompasses AHIMS sites #37-6-1911 (United Collieries 4 [Singleton]).
#37-6-1913	United Collieries 9	312608E, 6396599N	Low	United Collieries consists of less than ten artefacts recorded within small areas of exposure in an electricity easement. The site area has undergone significant modification and A Horizon soils are thin.
#37-6-1914	United Collieries 10	312558E, 6396674N	Low	United Collieries 10 consists of more than forty artefacts recorded within small areas of exposure in an electricity easement. The site area has been heavily modified during the construction of Dam 1.

As well as the sites detailed above, there are 49 previously recorded sites that are outside of the designated site boundaries of sites listed in **Table 9–1** and **Table 9–2**. Using the assessed archaeological potential of the Survey Area as shown in **Figure 9–2**, the current scientific significance of these sites can be determined (**Table 9–3**). As can be seen in the table, only two sites map within the zone of low–moderate archaeological potential: #37-5-0095; Red Bank Creek 27 (artefact scatter) and #37-5-0514; United Collieries 11 (isolated find). These two sites, as well as the location of the remaining 48 sites are shown in **Figure 9–2**. It is noted that sites #37-5-0561 (Wambo PAD T) and #37-6-2075 (Wambo PAD B) are recommended below (**Section 10.4.1**) for further subsurface investigation although in **Table 9–3** the sites are currently

assessed as having low scientific significance. However, as these sites were not investigated during the test excavation program as sites displaying higher potential were prioritised, the exact significance of these PADs are not precisely known. Therefore, the designation of low scientific significance in **Table 9–3** is provisional until such times as the salvage program set out in **Section 10.4.1** is enacted.

Figure 9-2. Previously recorded sites outside of sites designated during this assessment shown in relation to zones of archaeological potential.

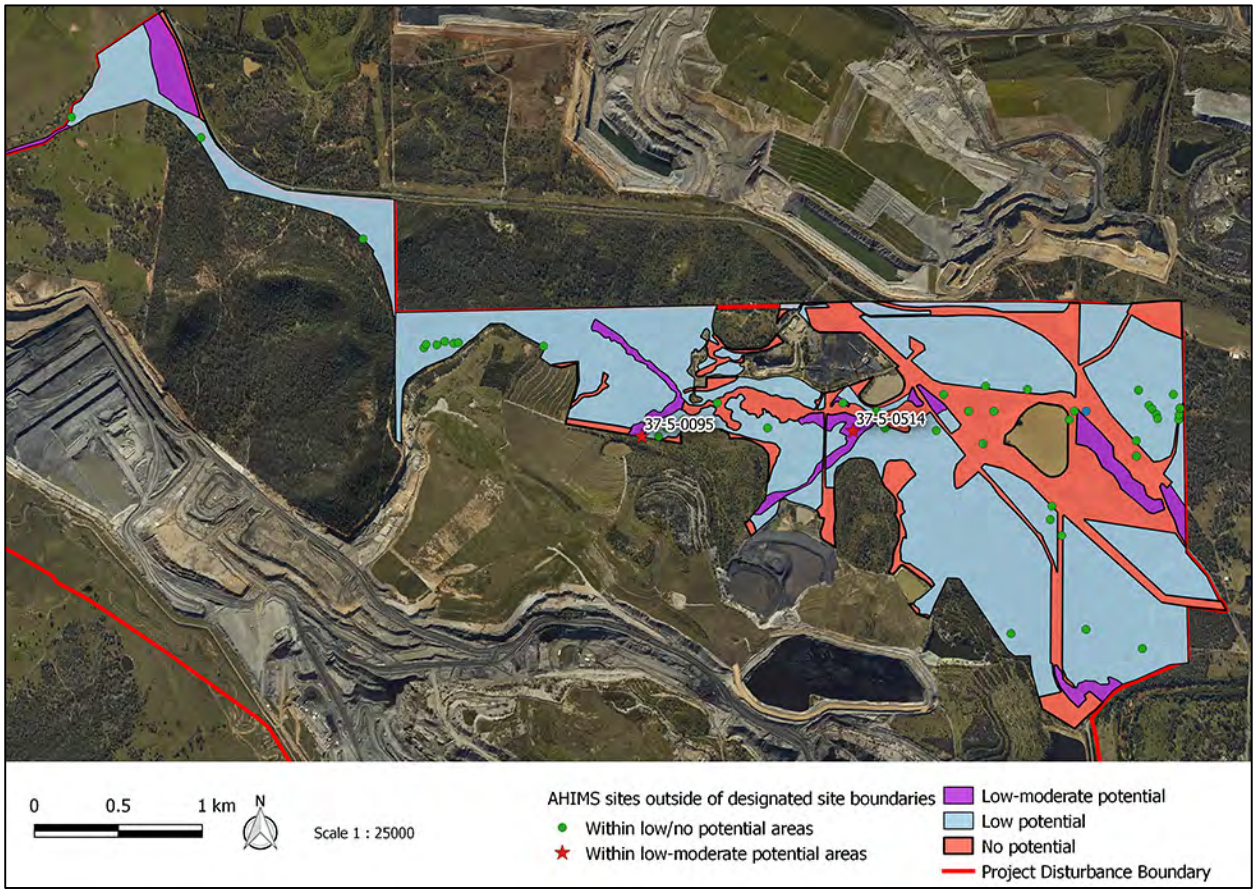


Table 9-3. Scientific significance of all previously recorded sites outside of sites designated during this assessment.

AHIMS number	Site Name	GDA Easting	GDA Northing	Site Status	Scientific significance
37-5-0024	Malabar	311405	6396590	Valid	Low
37-5-0083	Red Bank Creek 51	312455	6396790	Valid	Low
37-5-0085	Red Bank Creek 35	310905	6396640	Valid	Low
37-5-0095	Red Bank Creek 27	310655	6396540	Valid	Low–moderate
37-5-0097	Red Bank Creek 29	310805	6396590	Valid	Low
37-5-0098	Red Bank Creek 30	310755	6396540	Valid	Low
37-5-0101	Red Bank Creek 33	311105	6396740	Valid	Low
37-5-0103	Red bank Creek 22	312105	6396590	Valid	Low
37-5-0105	Red bank Creek 20	312055	6396690	Valid	Low
37-5-0106	Red Bank Creek 19	312055	6396690	Valid	Low

AHIMS number	Site Name	GDA Easting	GDA Northing	Site Status	Scientific significance
37-5-0109	Red bank Creek 16	311855	6396740	Valid	Low
37-5-0324	Wambo site 183	310069	6397078	Valid	Low
37-5-0387	Wambo site 272	308026	6398319	Valid	Low
37-5-0429	Wambo site 189	309356	6397068	Valid	Low
37-5-0430	Wambo site 188	309369	6397087	Valid	Low
37-5-0432	Wambo site 187	309433	6397085	Valid	Low
37-5-0433	Wambo site 186	309480	6397105	Valid	Low
37-5-0434	Wambo site 185	309534	6397094	Valid	Low
37-5-0435	Wambo site 184	309561	6397098	Valid	Low
37-5-0496	Haul Road 2	313100	6396125	Valid	Low
37-5-0514	United Collieries 11	311916	6396572	Valid	Low (although located in a zone of low–moderate archaeological potential this site type [isolated find] has low archaeological significance).
37-5-0519	United Collieries 8	312411	6396575	Valid	Low
37-5-0561	Wambo PAD T	307254	6398441	Valid	Low
37-5-0669	Wambo Site 328	308993	6397716	Valid	Low
37-6-0130	Agip 7 Warkworth	312689	6396497	Valid	Low
37-6-0132	Agip 10 Warkworth	313234	6396691	Valid	Low
37-6-0133	Warkworth Agip 8	313605	6396423	Valid	Low
37-6-0134	Agip 9 Warkworth	313604	6396515	Valid	Low
37-6-0272	Red Bank Creek 12	313305	6396690	Partially destroyed	Low
37-6-0324	Redbank Creek N0.46	312755	6396690	Valid	Low
37-6-0327	Redbank Creek No.49	312605	6396690	Valid	Low
37-6-0330	Redbank Creek No.42	313205	6396640	Valid	Low
37-6-0711	WB 13	313825	6396790	Valid	Low
37-6-1007	UC1/6	312955	6396820	Valid	Low
37-6-1008	UC1/7	312705	6396840	Valid	Low
37-6-1657	Haul Road 4	313159	6395950	Valid	Low
37-6-1771	140	313617	6396815	Valid	Low
37-6-1773	142	313680	6396725	Valid	Low
37-6-1774	143	313698	6396703	Valid	Low
37-6-1775	144	313725	6396671	Valid	Low
37-6-1776	145	313731	6396646	Valid	Low
37-6-1778	147	313857	6396641	Valid	Low
37-6-1779	148	313859	6396669	Valid	Low
37-6-1780	149	313864	6396708	Valid	Low
37-6-1781	150	313864	6396708	Valid	Low
37-6-1918	United Collieries 18 (Singleton)	312857	6395366	Valid	Low
37-6-1920	United Collieries 20 (Singleton)	313640	6395277	Valid	Low
37-6-1922	United Collieries 22 (Singleton)	313091	6396045	Valid	Low
37-6-2075	Wambo PAD B	313304	6395391	Valid	Low

10 ARCHAEOLOGICAL MANAGEMENT

This report will concentrate on the management of the archaeological values present within the Survey Area although given the cultural connection this archaeological landscape has for certain communities, a cultural understanding is also embedded in the archaeological management recommendations that follow.

From a purely archaeological perspective, much of the Survey Area is so disturbed that further archaeological investigation would only be able to address very basic research questions. As no meaningful archaeological information could be gained from these sites, a purely archaeological recommendation should be that no further investigation is justified.

However, the framework of the proposed archaeological management will be to understand that even if a site is disturbed in an archaeological sense, it may have value to certain communities. The task of the management recommendations in this report will be to frame research questions that will enable a thorough study of all the Survey Area's remaining archaeological values to be undertaken across all areas: not only those locations displaying higher archaeological values.

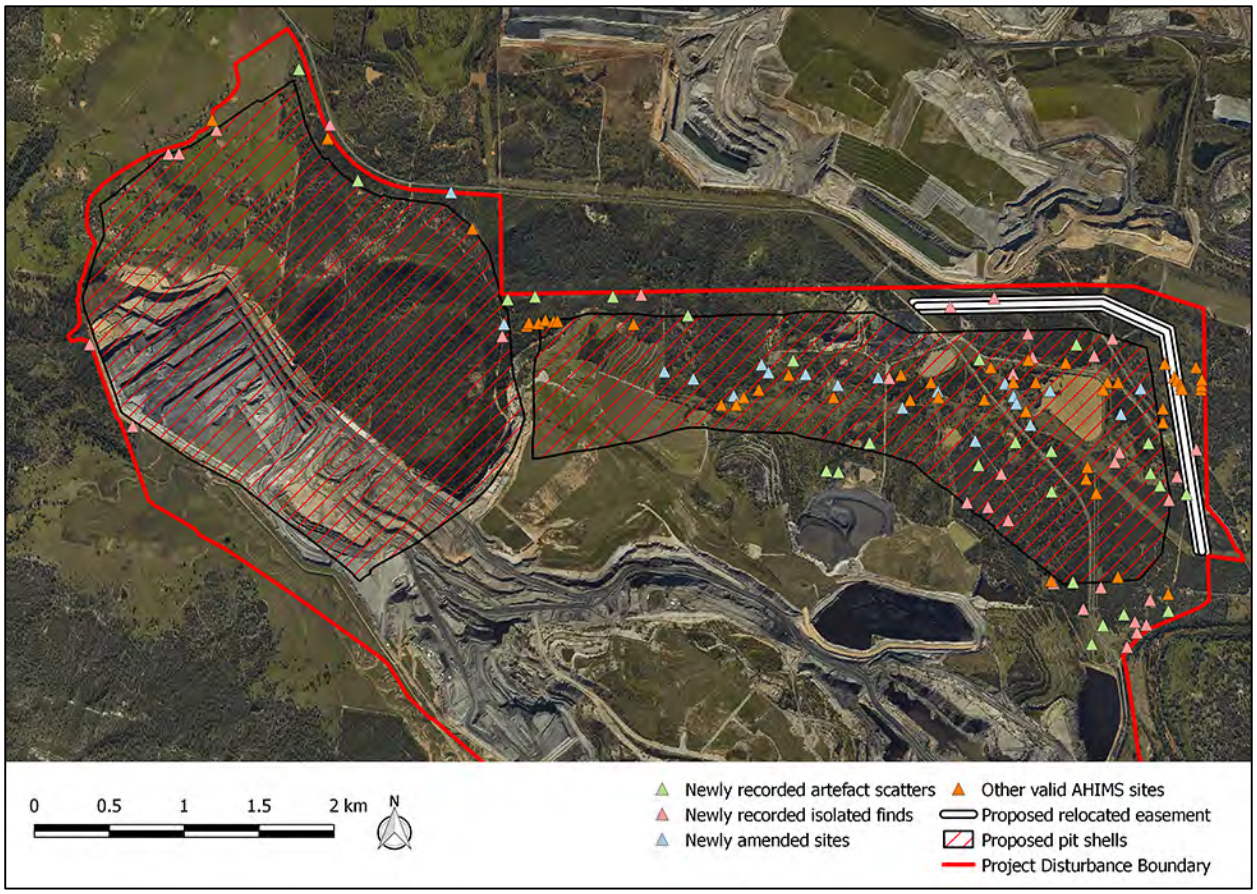
10.1 PROPOSED PROJECT IMPACT TO ABORIGINAL CULTURAL HERITAGE

For the purposes of this assessment it is assumed that 127 sites (80 artefact scatters, 45 isolated finds and two PADs) will be harmed (totally) by the Project. One site (Wambo 202; #37-5-0343) will be partially harmed by the Project. Those sites within the Project Disturbance Boundary and would be harmed by the proposed open cut pit, emplacement areas and other axillary infrastructure should the Project be approved.

Figure 10–1 plots all 128 sites liable to be impacted (totally or partially) with the major Project impacts: the proposed pit shells and the relocated electricity easement. The major impact pertaining to this study is the proposed United pit (the eastern pit in **Figure 10–1**). This aspect of the Project will impact the entire length of Redbank Creek within the proposed Project Disturbance Boundary, as well as all sites in association with the waterway.

Surrounding these impacts are service roads, drainage works, set-down areas and storage areas. Therefore it is assumed here that all sites located within the Proposed Disturbance Boundary will be impacted by the Project.

Figure 10-1. All extant sites in relation to major Project impacts.



10.2 MANAGEMENT OPTIONS

The management of any archaeological landscape must include the consideration of all available options and an evaluation of the viability of these options to achieve the best archaeological outcome.

In brief there are three main options available and the archaeological merits of each option will be discussed below.

Option A: Do Nothing

This option has a range of nuances from literally 'do nothing' through to 'do nothing' in terms of, in this case, mining associated with the Project, but at the same time, institute a programme of landform stabilisation to conserve the archaeological landform.

Option A1: Do nothing

This option is a real possibility because if the Project is not approved then a 'do nothing' option will be followed, probably with little more management of the archaeological landscape than is happening at present within the Survey Area.

As has been noted at length in the assessment results (**Sections 6** to **8**), erosion within the Survey Area is extensive and on-going. Many examples were observed during the assessment

of newly eroded artefacts and so it is clear that on-going destructive impacts are occurring to archaeological sites. A 'do nothing' option, in its purist sense, will mean no management of the archaeological landscape, and in the not too distant future, the bulk of the archaeological deposits remaining within the Survey Area may have eroded into the drainage lines.

Whilst no sites would be deliberately destroyed, this option will not stop the on-going natural deterioration of sites in the Survey Area, and as a result, this option would contribute to the cumulative loss of sites in the region.

Option A1 makes a small contribution to intergenerational equity as, in theory, the landscape is preserved (albeit with on-going erosion) and would be available for future generations to visit.

However, all of the Survey Area is either privately owned or part of a Travelling Stock Reserve. This does not allow, in the short term at least, for free access and use of any areas. Additionally, as discussed above, without management there will be a landscape surviving but one continuing to be denuded of A Horizon soils and a landscape without, in all likelihood, many archaeological sites in good condition.

Option A2: Do nothing with landform stabilisation

A 'do nothing' option with landscape stabilisation is problematic as this work is most needed along erosion exposures associated with drainage lines, i.e. precisely where the concentrations of artefacts were recorded during the assessment. A landscape stabilisation programme within the Survey Area would be a major undertaking (with associated costs) and would have to involve bank contouring, bank revetments and revegetation. While there are non-invasive landscape stabilisation methods available, such as hydromulching, these techniques would be of limited value given the widespread landscape and creek line degradation in the Survey Area. As a preliminary assessment, landscape stabilisation, on any meaningful level, would have a substantial impact to the bank areas of creeks and the associated archaeological sites.

Before such landscape stabilisation work could proceed, the archaeological sites along creek banks would most likely have to be harmed (i.e. salvaged). Whilst any artefacts recovered from harm could be returned to a stabilised landform, this has dubious archaeological outcomes and would not be recommended archaeologically.

Given the costs involved in landscape stabilisation in a location as degraded as the Survey Area, it is highly unlikely that this work would take place on the scale necessary to preserve the archaeological landscape of the Survey Area.

Further, it would need to be argued "What are we conserving?" as this assessment has demonstrated that there only remains isolated pockets of *in situ* archaeological deposits within the Survey Area. Therefore while landscape stabilisation could theoretically take place, it could be argued that the destruction of the area's archaeological values has already largely occurred.

While landform stabilisation would have undoubted benefits in terms of soil retention and revegetation, the value as a mechanism to conserve archaeological values within the Survey Area is a moot point.

Option A2 would add somewhat to the cumulative loss of Aboriginal cultural heritage sites in the region as any landform stabilisation of the creek banks would first require sites in these areas to be salvaged to remove cultural material from harm. Whilst artefacts could be returned to the area this cannot be regarded as reconstituting or restoring sites.

There is potential for this option to provide a contribution to intergenerational equity as the landscape stabilisation works and on-going management of the landscape could involve the local Aboriginal community and the landscape could be available (in theory, given that it is currently privately owned) for cultural and educational uses by future generations.

Option B: Modify Project design to avoid

Another option that should be considered is that certain areas, now within the Disturbance Area, could be excluded from the Project design and the areas conserved as archaeological / cultural zones.

As noted in **Section 9.4**, no individual artefact scatter, or group of artefact scatters was assessed as of high enough archaeological significance that would justify major design changes in order to avoid particular areas.

In addition, the results of all archaeological investigations within the Survey Area demonstrate that the concentration of sites is along Redbank Creek and its major tributaries. As this drainage line bisects the Survey Area it would be difficult, if not impossible, to alter the Project design to preserve portions or all of Redbank Creek.

While it is possible, in theory, to avoid mining activity in certain areas, the following questions need to be borne in mind:

- What is being saved?
- Does the item have high enough social or archaeological values to justify saving?
- What is the long-term advantage of saving such an item?
- How will the item ultimately be managed and used?
- Would the benefit of doing these works from an archaeological perspective be outweighed by other archaeological mitigation strategies?

As noted above, there are several factors that lower the integrity of the sites within the Survey Area to the point where it must be asked, “What is being saved?” The loss of archaeological landscape context, the impact of on-going erosion and the danger of continuing disturbances from nearby mining all make it less certain that what is being saved justifies major Project design

changes. In such a situation, mitigation strategies (both archaeological and cultural) may have a greater archaeological outcome than retaining these sites *in situ*.

Should Option B be followed then the Project would contribute less to the cumulative loss of sites in the region by permanently preserving a number sites. The Project could also add to intergenerational equity by following Option B as the preserved areas would potentially be available, at some time when mining concludes, for future generations to use and enjoy.

If it were possible, the current assessment would support an Option B approach. However, elsewhere in this EIS, the rationale behind the need to mine in areas such as in the Redbank Creek area are given. Given the condition and context of the sites, the history of past impacts in their vicinity and their location in areas vital for the successful operation of the Project, the current assessment does not see an Option B approach for archaeological management as practical and therefore this option is not recommended.

Option C: No design change and mitigate archaeological impacts

If Option B is not feasible, as noted above, then the best course of action, speaking archaeologically, is that the Project proceeds and that the resources are made available to properly manage the remaining archaeological resource in the face of the proposed impacts. This is argued because unless the Project is approved, the resources will not be available to further study the archaeological resource that is, regardless of the current Project, currently being destroyed by extensive erosion.

This option would be carried with the advice and involvement of the RAPs. It would also follow all appropriate guidelines pertaining to the NPW Act. This option is also supported in Article 28 of the Burra Charter (ICOMOS 2013) that reads:

> *Article 28. Disturbance of fabric*
>
> *28.1 Disturbance of significant fabric for study, or to obtain evidence, should be minimised. Study of a place by any disturbance of the fabric, including archaeological excavation, should only be undertaken to provide data essential for decisions on the conservation of the place, or to obtain important evidence about to be lost or made inaccessible.*
>
> *28.2 Investigation of a place which requires disturbance of the fabric, apart from that necessary to make decisions, may be appropriate provided that it is consistent with the policy for the place. Such investigation should be based on important research questions which have potential to substantially add knowledge, which cannot be answered in other ways and which minimises disturbance to the fabric.*

In the face of widespread disturbance, Option C is justified “to obtain important evidence about to be lost or made inaccessible”. This loss of fabric (i.e. archaeological sites) will be minimised in

the sense that only areas within the Project Disturbance Boundary will be investigated and all archaeological investigations will be framed within research questions that will allow as much information to be captured before the sites are irrevocably damaged by erosion and "lost" for ever. The "policy" to oversee and control this "destruction of fabric" would be an ACHMP that would be developed in consultation with RAPs, Wonnarua Knowledge Holders and the Department of Planning and Environment and submitted following Project approval.

Option C does nothing to address the cumulative loss of sites from the region as large parts of the Survey Area would be subject to archaeological salvage works. Option C also does not add substantially to intergenerational equity apart from the fact that the salvage programme, if conducted as described below, will capture further information about the archaeological landscape and artefacts within the Survey Area that will be of use to future generations and scholars seeking information on the area.

As was stated above, Option B would have a desirable archaeological outcome, albeit with attendant issues such as on-going conservation and management, and if Redbank Creek were avoided, greatly diminishing Project viability. However, should the Project be approved in its present form, Option C will form the basis of the management recommendations and these will be dealt with below.

10.3 MANAGEMENT STRUCTURE

The following management recommendations are framed as if Option C (above) is to be followed: namely that the Project is approved and sites within the Project Disturbance Boundary will be archaeologically salvaged in order to not only remove artefacts from harm but to gain as much information about the sites as is possible to partially mitigate the Project impacts.

As was stated in **Section 9.1**, it is understood that even if a site has an assessment of low scientific significance, further management will nonetheless be applied to it in respect of the connection many people in the Aboriginal and the wider community may have to the archaeological site. Therefore, even a low density artefact scatter in a disturbed context will be salvaged, and although a site such as this will only ever be able to address basic archaeological questions, answers to these basic questions will, nevertheless, be sought.

With this in mind, it is proposed that the management of the archaeological landscape within the Survey Area be framed in terms of research questions that will be applied to each management area. In this way the archaeological management of the Survey Area will maintain a scientific rigour making any data collected verifiable and reliable. This will ensure that as much information is gained about sites in the face of the proposed impacts.

In summary, these research questions aim to investigate two main questions that would help in our understanding of the archaeology of the Survey Area, namely:

- Research Aim 1: Are there variations in site distribution and / or site type along a landform such as a waterway within the Survey Area (intra-site variability)?
- Research Aim 2: Are there variations in artefact features, such as raw material type, across the Survey Area (inter-site variability)?

In order to obtain the data to answer these questions, two research questions are proposed to be investigated. These are set out in **Section 10.3.2**.

The archaeological management regime will employ two management categories: a Category 1 archaeological salvage at the remaining artefact exposures and a Category 2 archaeological salvage in order to record and recover all visible artefacts from the smaller exposures and isolated locations.

A further management category, Category A, has been created to manage sites in situations that may become evident but which are, at present, unknown. Category A will include any sites that are avoided by Project redesign as the review and finalisation of the Project EIS takes place. This is to ensure that should sites be able to be avoided, for whatever reason in the future, that they would form part of this category so that this report does not have to be redrafted to take into account these changes.

10.3.1 Category A: Avoidance through Project Redesign

As canvassed in Option B above, a desirable archaeological outcome would be to avoid impact to certain areas through Project redesign. In particular, the areas along Redbank Creek were discussed as possible areas for avoidance due to the fact that this is where the greatest concentration of sites is located.

However, for reasons stated previously (**Section 10.2**), no particular sites or places are specifically recommended for avoidance in this report although this option would be supported were it to happen: either as recognition for the areas' archaeological values or because of other, non-archaeological, considerations that may necessitate a design change.

10.3.2 Option C Management Categories

Should the Project be approved in its present form the following management categories (1–2) are recommended in order to mitigate harm from the proposed works to the archaeological values of the Survey Area.

The following management controls have been demonstrated in the past as being effective at capturing scientific / archaeological information relevant to our understanding of past Aboriginal land use in the district.

10.3.2.1 Category 1: Archaeological Salvage: Focused Subsurface Investigations

Research Aim 1: sites with low–moderate scientific significance. Is there any variation in the distribution of sites within a specific landform, such as along a waterway, in the Survey Area?

Action: To conduct targeted archaeological excavations to recover meaningful samples of artefacts in order to determine if there are changes in the distribution of artefacts along a landform.

Aim: Archaeological data obtained will allow a local / regional analysis whereby the distribution of artefacts within a landform can be studied.

Research Design: Adjacent to visible artefact exposures up to ten 0.5m x 0.5m excavation squares should be excavated. The excavation squares could be grouped to maximise information in one area, or spaced out to maximise cover. If spread out, it is recommended that pairs of 0.5m x 0.5m squares are excavated together to gain a meaningful sample from any area. These squares, in 0.5m x 0.5m increments, could be expanded if finds or deposits indicate that it would be advantageous. Location details and a proposed methodology for Category 1 investigations are given in **Section 10.4.1**. In the proposed salvage methodology there are listed triggers that allow a Category 1 investigation to expand within a focused area.

10.3.2.2 Category 2: Archaeological Salvage: Artefact Collection

Research Aim 2: sites with low scientific significance. On a macro level, is there any variation in the distribution of certain artefact attributes such as raw material type and artefact type across the Survey Area?

Action: To conduct an analysis of the raw materials and basic artefact features to determine whether there is site to site variation across the Survey Area, particularly in sites located away from water.

Aim: Archaeological data obtained will allow a local level analysis of distribution patterns within the Survey Area.

Research Design: All visible artefacts should be flagged in the field. On hand-held GIS units, the location, artefact class and artefact type will be catalogued in the field. A representative sample of artefacts and views of site and *in situ* artefacts will be photographed. When recorded, all artefacts from the surface of the site will be collected and moved to a place of safe-keeping.

In the unlikely event that a Category 2 site displays evidence at the time of salvage that subsurface artefacts may be present, then Category 1 archaeological salvage could take place at that site following assessment by the supervising archaeologist and RAPs present that it would be prudent to do so.

Location and methodology details for Category 2 investigations are given in **Section 10.4.2**.

10.4 ARCHAEOLOGICAL MANAGEMENT RECOMMENDATIONS

10.4.1 Management: Category 1 sites

This category contains sites and items that have been assessed as holding low–moderate scientific significance and will have Research Aim 1 applied to them.

The archaeological recommendation for Research Aim 1 is to conduct focused archaeological salvage excavations immediately adjacent to several artefact exposures in order to better understand the nature of a localised site.

It is envisioned that Category 1 investigations would include the following methodology although the final form of any investigation would be done in consultation with the RAPs and Wonnarua Knowledge Holders:

- All surface artefacts should be collected and moved to a place of safe-keeping under the methodology of Category 2 management. This is to ensure that the artefacts are not harmed during the following excavation process;
- The results of the Category 2 artefact collection, and discussions between archaeologists and RAPs, will determine where further archaeological salvage is to take place within a given area. Some suggestions of locations are given in **Figure 10–2**;
- It would be possible to conduct up to five shovel pits (approximately 0.15m x 0.15m) at any location to help determine the placement of excavation squares;
- A minimum of ten 0.5m x 0.5m excavation squares (2.5 square metres) would be excavated to culturally sterile soil levels within one investigation area;
- The ten excavation squares could be grouped together or spaced at no more than 5m apart. Thus a 45m transect could be investigated, or a 2.5 square metre contiguous area excavated.
- Spits at each area would start in 5cm increments although 10cm increments could be used once it is established it is archaeologically prudent to do so;
- All deposits would be dry sieved at location;
- All recording will be done in the field in standard context sheets and the archaeologist will ensure that all necessary photographs, section drawings and soil analysis shall take place;
- A maximum area of 2.5 square metres shall be excavated at any one area unless deposits and finds warranted a further expansion (see below);
- The decision to expand from the mandated 2.5 square metres shall be determined by the results of the ten 0.5m x 0.5m squares and would be done in consultation between the archaeologists and RAPs present;

- Should deposits or finds indicate that it would be desirable to expand beyond the 2.5 square metres, this will be possible if agreement is reached between the archaeologist and RAPs present. The grounds for expansion would include:
    - The complete excavation of a feature (such as a hearth) that may have been intersected by an excavation square; and
    - The complete excavation of a concentration of artefacts such as a knapping floor that may have been intersected by an excavation square.
- Any expansion beyond the 2.5 square metres would include areas totalling no more than 40% of the original area (i.e. an additional four 0.5m x 0.5m squares [one square metre] would be permissible);
- In what is assessed as an unlikely event, should excavations under Category 1 archaeological salvage encounter high value archaeological deposits, it should be possible to even further expand the archaeological salvage at that location. Deposits or features that would characterise high value deposits include:
    - Undisturbed deposits showing discernible archaeological stratigraphy;
    - Any exceptional finds (unusual materials, rare preservation, rare artefact type) believed to have archaeological context; and
    - A high density of artefacts[12] (in excess of 60 per square metre) in undisturbed contexts.
- Should the excavations encounter a human burial, all work should cease in the area and advice from authorities and RAPs (should the remains be Aboriginal) sought;
- All excavated material (stone tools, bone, shell etc) will be fully analysed and a report of the findings prepared; and
- Analysis will attempt to answer Research Aim 1 which is to record a statistically valid artefact assemblage from the site in order to better understand intra-site variations.

Table 10–1 lists the eight sites where Category 1 salvage is recommended and these locations are shown in **Figure 10–2**.

[12] An artefact is defined here as being larger than 15mm. Therefore a concentration of small debitage or shatter would not constitute an ‘artefact concentration’ unless the archaeologist and RAPs present felt that this had archaeological merit.

Figure 10-2. Location of sites where Category 1 salvage is recommended.

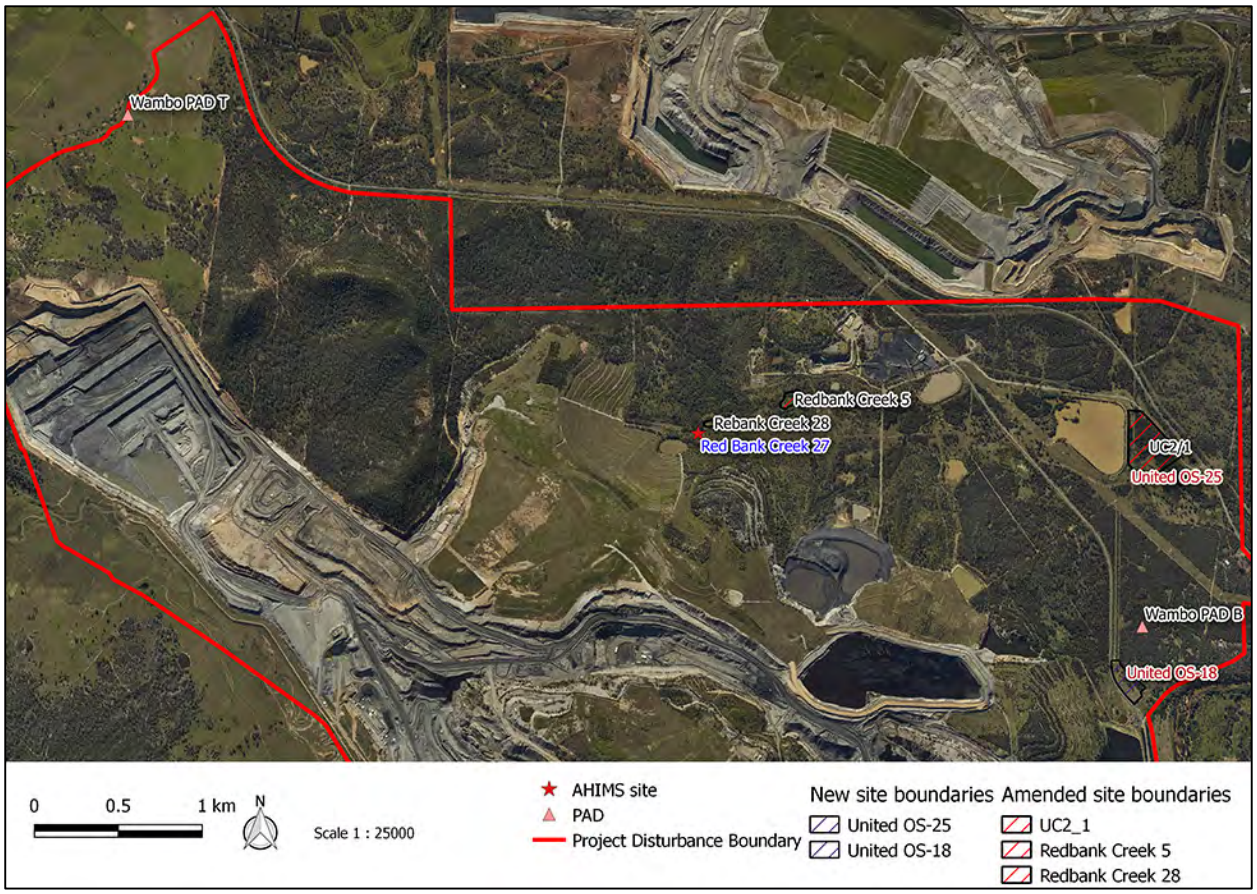


Table 10-1. Archaeological recommendations for the management of Category 1 sites.

Site Name	AHIMS number	Archaeological Recommendation	Comment
United OS-18	pending	Research Aim 1: Category 1 archaeological salvage on the eastern bank of the drainage line expanding from the test excavation at Area 4 TR4 Sq2.	During the test excavation program, the greatest concentration of artefacts was recorded in Area 4 Tr4 Sq2. This concentration appeared to be *in situ*. Category 1 excavations should investigate the area surrounding Area 4 Tr4 more comprehensively. Please note Insite Heritage 2010b: 34 (figure 3) for the location of 2009 excavation transects located 20m due east from Tr4 and avoid these areas.
United OS-25	pending	Category 1 archaeological salvage on the western bank of Redbank Creek in the vicinity of the test excavation Area 6 Tr3.	Some artefact concentrations were recorded during the test excavation program at Area 6 Tr3. While there is only a narrow area between the creek bank and disturbed areas to the west (marked by the farm track and dams), this area should be more comprehensively investigated to determine the extent of the deposits. Same landform as UC2/1 (below) although further south.
Red Bank Creek 27	37-5-0095	Category 1 archaeological salvage on the eastern bank of Redbank Creek.	Located in proximity to Red Bank Creek 28 (see below), investigations in both these areas will provide further information on the nature of deposits on the eastern bank of what was the main arm of Redbank Creek.

Site Name	AHIMS number	Archaeological Recommendation	Comment
Red Bank Creek 28	37-5-0096	Category 1 archaeological salvage on the eastern bank of Redbank Creek.	This site is in proximity to Red Bank Creek 27 (see above) and together both sites will add to our knowledge concerning deposits along what was the main arm of Redbank Creek. Investigations should be biased to the western portions of the site as the auger program (Auger location 7) demonstrated that soils become thinner towards the east.
Red Bank Creek 5	37-5-0116	Category 1 archaeological salvage on the southern bank of Redbank Creek.	Although extensively test during the test excavation program (Area 2), further investigation should take place adjacent to the areas investigated by Koettig and Hughes in 1983 (see **Figure 6–9**). These investigations will allow further comparison with the earlier research to be made.
Wambo PAD T	37-5-0561	Category 1 archaeological salvage on the southern bank of Waterfall Creek.	The site was assessed during the survey and it was determined that the area held little archaeological potential and the area was not included in the test excavation program that was devoted to sites with greater potential. However, to ensure that the current assessment of low potential is correct, Category 1 salvage should take place at the site location.
UC2/1	37-6-1033	Category 1 archaeological salvage on the western bank of Redbank Creek.	Located in the same landform as United OS-25 (see above). As this is a large area it is recommended that Category 1 salvage take place as close as is practical to the three previously recorded sites within this site: • 37-6-0131: Agip 6 Warkworth: GDA Zone 56 313238E, 6396508N; • 37-6-1033: UC2/1: GDA Zone 56 313255E, 6396590N; and • 37-6-0275: Red Bank Creek 10: GDA Zone 56 313355E, 6396440N.
Wambo PAD B	37-6-2075	Category 1 excavation at the site location.	The site was assessed during the survey and it was determined that the area held little archaeological potential and the area was not included in the test excavation program that was devoted to sites with greater potential. However, to ensure that the current assessment of low potential is correct, Category 1 salvage should take place at the site location. Site card agrees the AHIMS location for the PAD is correct and also states “recorded in the (Wambo) EIS by Elizabeth White 2003 and was included in the S87/S90 application by Navin Officer Heritage Consultants P/L April 2005 - Consent Application Permit #2222 was approved and dated 20/06/2005.” However, as this site is outside of the Wambo Approval Area it is unlikely the site was ever salvaged.

10.4.2 Management: Category 2 sites

Stone artefact sites managed under Category 2 archaeological salvage will contribute to Research Aim 2 namely that the sites will have surface artefacts mapped, catalogued, selectively photographed, collected and moved to safe-keeping.

It is envisioned that Category 2 investigations would include the following methodology although the final form of any investigation would be done in consultation with the RAPs:

- Category 2 archaeological salvage equates to a recorded surface collection of artefacts;
- In order to fulfil the aims of Research Aim 2, the following program is suggested:
    - All visible artefacts at a site should be flagged in the field;
    - The site should be photographed after flagging and before recording;
    - All artefacts should have the following artefact information entered directly into a GPS unit, albeit one set up with all variable fields already entered to make the field recording job more efficient:
        - Location;
        - Artefact Type;
        - Size;
        - Reduction level;
        - Raw Material; and
        - Notes.
    - A selection of indicative and / or unusual artefacts from each site will be photographed;
    - Once all recording is complete, the artefacts will be collected with each site being kept separate.
- If at the time of salvage there is evidence that subsurface deposits exist at a particular site then, with the agreement of the archaeologist and RAPs present, Category 1 archaeological salvage would take place at that site;
- Should the excavations encounter a human burial, all work should cease in the area and advice from authorities and RAPs (should the remains be Aboriginal) sought;
- The recording of the artefacts recovered will largely be completed in the field and this data would be incorporated into a report; and
- Analysis will attempt to answer Research Aim 2 which is to record a statistically valid artefact assemblage from across the Survey Area in order to better understand inter-site variations.

10.4.3 Reburied artefacts

Although not included in any of the calculations above, a further area will require subsurface salvage in order to retrieve artefacts that were reburied following two salvage programs carried out in 2008 (Insite Heritage 2010a) and 2009 (Insite Heritage 2010a). Artefacts from these sites were reburied loose in the ground (cf. Insite Heritage 2010b: plate 19) with each site being kept separate and marked on the surface by a wooden stake. The photographs of the reburial indicate that the artefacts were reburied up to 15cm below the surface. The artefacts were not placed in plastic bags and there is no reference to modern identifying markers being placed with the

artefacts. Although the reports say that location details were sent to AHIMS (Insite Heritage 2010a: 47, 2010b: 48) the location does not appear on AHIMS.

The artefact reburial location was noted during the survey to be at GDA Zone 56 310790E, 6397021N.

During the salvage program these artefacts will need to be retrieved but their excavation does not have to be conducted in an archaeological manner. It is recommended that an area encompassing 30cm from each stake be excavated to determine where the artefacts are located. Deposits may need to be sieved to retrieve the artefacts. This location has been added to **Table 10–2** to ensure it is not overlooked although it is not formerly part of the management categories discussed here.

10.5 TABULATION OF MANAGEMENT CATEGORIES

Within the Survey Area are 128 sites (81 artefact scatters, 45 isolated finds and two PADs).

Table 10–2 presents salient information regarding each site including its assessed scientific significance, Project impact and the recommended management category for that site.

Table 10-2. Scientific significance assessment, Project impact and management category of all Aboriginal sites within the Survey Area.

Site Type	AHIMS Number	Site name	GDA Zone 56	Scientific significance assessment	Project Impact	Management Category
Newly recorded sites						
Artefact scatter	pending	United OS-1	307834E 6398781N	Low	Total	Category 2
Artefact scatter	pending	United OS-2	308228E 6398037N	Low	Total	Category 2
Artefact scatter	pending	United OS-3	309228E 6397244N	Low	Total	Category 2
Artefact scatter	pending	United OS-4	309411E 6397262N	Low	Total	Category 2
Artefact scatter	pending	United OS-5	309931E 6397262N	Low	Total	Category 2
Artefact scatter	pending	United OS-6	310432E 6397137N	Low	Total	Category 2
Artefact scatter	pending	United OS-7	311135E 6396836N	Low	Total	Category 2
Artefact scatter	pending	United OS-8	311357E 6396100N	Low	Total	Category 2
Artefact scatter	pending	United OS-9	311438E 6396092N	Low	Total	Category 2
Artefact scatter	pending	United OS-10	311646E 6396285N	Low	Total	Category 2
Artefact scatter	pending	United OS-11	312373E 6396137N	Low	Total	Category 2
Artefact scatter	pending	United OS-12	312620E 6396290N	Low	Total	Category 2
Artefact scatter	pending	United OS-13	312378E 6396843N	Low	Total	Category 2
Artefact scatter	pending	United OS-14	313027E 6396942N	Low	Total	Category 2
Artefact scatter	pending	United OS-15	312861E 6395961N	Low	Total	Category 2
Artefact scatter	pending	United OS-16	312859E 6396231N	Low	Total	Category 2

Site Type	AHIMS Number	Site name	GDA Zone 56	Scientific significance assessment	Project Impact	Management Category
Artefact scatter	pending	United OS-17	313004E 6395356N	Low	Total	Category 2
Artefact scatter	pending	United OS-18	313204E 6395068N	Low–moderate	Total	Category 1
Artefact scatter	pending	United OS-19	313129E 6394943N	Low	Total	Category 2
Artefact scatter	pending	United OS-20	313344E 6395141N	Low	Total	Category 2
Artefact scatter	pending	United OS-21	313641E 6395164N	Low	Total	Category 2
Artefact scatter	pending	United OS-22	313521E 6396083N	Low	Total	Category 2
Artefact scatter	pending	United OS-23	313585E 6396001N	Low	Total	Category 2
Artefact scatter	pending	United OS-24	313762E 6395944N	Low	Total	Category 2
Artefact scatter	pending	United OS-25	313508E 6396284N	Low–moderate	Total	Category 1
Isolated find	pending	United IF-1	306963E, 6398215N	Low	Total	Category 2
Isolated find	pending	United IF-2	307034E, 6398216N	Low	Total	Category 2
Isolated find	pending	United IF-3	307283E, 6398374N	Low	Total	Category 2
Isolated find	pending	United IF-4	308042E, 6398409N	Low	Total	Category 2
Isolated find	pending	United IF-5	306437E, 6396944N	Low	Total	Category 2
Isolated find	pending	United IF-6	306724E, 6396397N	Low	Total	Category 2
Isolated find	pending	United IF-7	309192E, 6396998N	Low	Total	Category 2
Isolated find	pending	United IF-8	309356E, 6397070N	Low	Total	Category 2
Isolated find	pending	United IF-9	310119E, 6397274N	Low	Total	Category 2
Isolated find	pending	United IF-10	311776E, 6396718N	Low	Total	Category 2
Isolated find	pending	United IF-11	312296E, 6395887N	Low	Total	Category 2
Isolated find	pending	United IF-12	312436E, 6395857N	Low	Total	Category 2
Isolated find	pending	United IF-13	312524E, 6396079N	Low	Total	Category 2
Isolated find	pending	United IF-14	312571E, 6395769N	Low	Total	Category 2
Isolated find	pending	United IF-15	312184E, 6397195N	Low	Total	Category 2
Isolated find	pending	United IF-16	312478E, 6397253N	Low	Total	Category 2
Isolated find	pending	United IF-17	312703E, 6397015N	Low	Total	Category 2
Isolated find	pending	United IF-18	312603E, 6396745N	Low	Total	Category 2
Isolated find	pending	United IF-19	312734E, 6396857N	Low	Total	Category 2
Isolated find	pending	United IF-20	313145E, 6396866N	Low	Total	Category 2
Isolated find	pending	United IF-21	313267E, 6396982N	Low	Total	Category 2
Isolated find	pending	United IF-22	312874E, 6395349N	Low	Total	Category 2
Isolated find	pending	United IF-23	313073E, 6395177N	Low	Total	Category 2
Isolated find	pending	United IF-24	313365E, 6394924N	Low	Total	Category 2

Site Type	AHIMS Number	Site name	GDA Zone 56	Scientific significance assessment	Project Impact	Management Category
Isolated find	pending	United IF-25	313190E, 6395321N	Low	Total	Category 2
Isolated find	pending	United IF-26	313431E, 6395020N	Low	Total	Category 2
Isolated find	pending	United IF-27	313418E, 6395092N	Low	Total	Category 2
Isolated find	pending	United IF-28	313494E, 6395072N	Low	Total	Category 2
Isolated find	pending	United IF-29	313519E, 6395238N	Low	Total	Category 2
Isolated find	pending	United IF-30	313283E, 6396158N	Low	Total	Category 2
Isolated find	pending	United IF-31	313313E, 6396222N	Low	Total	Category 2
Isolated find	pending	United IF-32	313645E, 6395904N	Low	Total	Category 2
Isolated find	pending	United IF-33	313699E, 6396061N	Low	Total	Category 2
Isolated find	pending	United IF-34	313828E, 6396242N	Low	Total	Category 2
Amended site boundaries						
Artefact scatter	#37-5-0025	Agip 2 Malabar	311455E, 6396668N	Low	Total	Category 2
Artefact scatter	#37-5-0028	Malabar Agip 3	310305E, 6396790N	Low	Total	Category 2
Artefact scatter	#37-5-0096	Red Bank Creek 28	310742E, 6396601N	Low–moderate	Total	Category 1
Artefact scatter	#37-5-0099	Red Bank Creek 31	310921E, 6396810N	Low	Total	Category 2
Artefact scatter	#37-5-0100	Red Bank Creek 32	310973E, 6396755N	Low	Total	Category 2
Artefact scatter	#37-5-0110	Red Bank Creek 15	311701E, 6396723N	Low	Total	Category 2
Artefact scatter	#37-5-0115	Red Bank Creek 8	312119E, 6396619N	Low	Total	Category 2
Artefact scatter	#37-5-0116	Red Bank Creek 5	311209E, 6396747N	Low–moderate	Total	Category 1
Artefact scatter	#37-5-0343	Wambo 202	308850E, 6397962N	Low	Partial	Category 2 management within the Disturbance Area.
Artefact scatter	#37-5-0349	Wambo 190	309204E, 6397081N	Low	Total	Category 2
Artefact scatter	#37-5-0520	United Collieries 23	312357E, 6396285N	Low	Total	Category 2
Artefact scatter	#37-5-0523	United 6	311879E, 6396514N	Low	Total	Category 2
Artefact scatter	#37-5-0576	UCL 12-1	310477E, 6396730N	Low	Total	Category 2
Artefact scatter	#37-6-0325	Red Bank Creek 47	312878E, 6396647N	Low	Total	Category 2
Artefact scatter	#37-6-0326	Red Bank Creek 48	312627E, 6396551N	Low	Total	Category 2
Artefact scatter	#37-6-1033	UC2/1	313323E, 6396475N	Low–moderate	Total	Category 1
Artefact scatter	#37-6-1777	146	313461E, 6396646N	Low	Total	Category 2
Artefact scatter	#37-6-1912	United Collieries 5	312882E, 6396331N	Low	Total	Category 2
Artefact scatter	#37-6-1913	United Collieries 9	312608E, 6396599N	Low	Total	Category 2
Artefact scatter	#37-6-1914	United Collieries 10	312558E, 6396674N	Low	Total	Category 2
Other AHIMS sites						
Artefact scatter	37-5-0024	Malabar	311405E, 6396590N	Low	Total	Category 2

Site Type	AHIMS Number	Site name	GDA Zone 56	Scientific significance assessment	Project Impact	Management Category
Artefact scatter	37-5-0083	Red Bank Creek 51	312455E, 6396790N	Low	Total	Category 2
Artefact scatter	37-5-0085	Red Bank Creek 35	310905E, 6396640N	Low	Total	Category 2
Artefact scatter	37-5-0095	Red Bank Creek 27	310655E, 6396540N	Low–moderate	Total	Category 1
Artefact scatter	37-5-0097	Red Bank Creek 29	310805E, 6396590N	Low	Total	Category 2
Artefact scatter	37-5-0098	Red Bank Creek 30	310755E, 6396540N	Low	Total	Category 2
Artefact scatter	37-5-0101	Red Bank Creek 33	311105E, 6396740N	Low	Total	Category 2
Artefact scatter	37-5-0103	Red bank Creek 22	312105E, 6396590N	Low	Total	Category 2
Artefact scatter	37-5-0105	Red bank Creek 20	312055E, 6396690N	Low	Total	Category 2
Artefact scatter	37-5-0106	Red Bank Creek 19	312055E, 6396690N	Low	Total	Category 2
Artefact scatter	37-5-0109	Red bank Creek 16	311855E, 6396740N	Low	Total	Category 2
Isolated find	37-5-0324	Wambo site 183	310069E, 6397078N	Low	Total	Category 2
Isolated find	37-5-0387	Wambo site 272	308026E, 6398319N	Low	Total	Category 2
Artefact scatter	37-5-0429	Wambo site 189	309356E, 6397068N	Low	Total	Category 2
Isolated find	37-5-0430	Wambo site 188	309369E, 6397087N	Low	Total	Category 2
Artefact scatter	37-5-0432	Wambo site 187	309433E, 6397085N	Low	Total	Category 2
Artefact scatter	37-5-0433	Wambo site 186	309480E, 6397105N	Low	Total	Category 2
Artefact scatter	37-5-0434	Wambo site 185	309534E, 6397094N	Low	Total	Category 2
Artefact scatter	37-5-0435	Wambo site 184	309561E, 6397098N	Low	Total	Category 2
Artefact scatter	37-5-0496	Haul Road 2	313100E, 6396125N	Low	Total	Category 2
Isolated find	37-5-0514	United Collieries 11	311916E, 6396572N	Low	Total	Category 2
Artefact scatter	37-5-0519	United Collieries 8	312411E, 6396575N	Low	Total	Category 2
PAD	37-5-0561	Wambo PAD T	307254E, 6398441N	Low	Total	Category 1
Artefact scatter	37-5-0669	Wambo Site 328	308993E, 6397716N	Low	Total	Category 2
Artefact scatter	37-6-0130	Agip 7 Warkworth	312689E, 6396497N	Low	Total	Category 2
Artefact scatter	37-6-0132	Agip 10 Warkworth	313234E, 6396691N	Low	Total	Category 2
Artefact scatter	37-6-0133	Warkworth Agip 8	313605E, 6396423N	Low	Total	Category 2
Artefact scatter	37-6-0134	Agip 9 Warkworth	313604E, 6396515N	Low	Total	Category 2
Artefact scatter	37-6-0272	Red Bank Creek 12	313305E, 6396690N	Low	Total	Category 2
Artefact scatter	37-6-0324	Redbank Creek N0.46	312755E, 6396690N	Low	Total	Category 2
Artefact scatter	37-6-0327	Redbank Creek No.49	312605E, 6396690N	Low	Total	Category 2
Artefact scatter	37-6-0330	Redbank Creek No.42	313205E, 6396640N	Low	Total	Category 2
Artefact scatter	37-6-0711	WB 13	313825E, 6396790N	Low	Total	Category 2
Artefact scatter	37-6-1007	UC1/6	312955E, 6396820N	Low	Total	Category 2
Artefact scatter	37-6-1008	UC1/7	312705E, 6396840N	Low	Total	Category 2
Artefact scatter	37-6-1657	Haul Road 4	313159E, 6395950N	Low	Total	Category 2

Site Type	AHIMS Number	Site name	GDA Zone 56	Scientific significance assessment	Project Impact	Management Category
Isolated find	37-6-1771	140	313617E, 6396815N	Low	Total	Category 2
Artefact scatter	37-6-1773	142	313680E, 6396725N	Low	Total	Category 2
Isolated find	37-6-1774	143	313698E, 6396703N	Low	Total	Category 2
Artefact scatter	37-6-1775	144	313725E, 6396671N	Low	Total	Category 2
Artefact scatter	37-6-1776	145	313731E, 6396646N	Low	Total	Category 2
Isolated find	37-6-1778	147	313857E, 6396641N	Low	Total	Category 2
Isolated find	37-6-1779	148	313859E, 6396669N	Low	Total	Category 2
Isolated find	37-6-1780	149	313864E, 6396708N	Low	Total	Category 2
Isolated find	37-6-1781	150	313864E, 6396708N	Low	Total	Category 2
Artefact scatter	37-6-1918	United Collieries 18 (Singleton)	312857E, 6395366N	Low	Total	Category 2
Isolated find	37-6-1920	United Collieries 20 (Singleton)	313640E, 6395277N	Low	Total	Category 2
Artefact scatter	37-6-1922	United Collieries 22 (Singleton)	313091E, 6396045N	Low	Total	Category 2
PAD	37-6-2075	Wambo PAD B	313304E, 6395391N	Low	Total	Category 1
Artefact reburial location						
Non-archaeological location	pending	Artefact reburial location	310790E, 6397021N	n/a	Total	Non-archaeological retrieval of all artefacts.

It is envisioned that these recommendations and information be used to develop, in consultation with the RAPs and Wonnarua Knowledge Holders, an ACHMP for the Survey Area that captures and expands upon all information included in this document that will address range of matters including salvage methodologies, conservation options and the care and control of salvaged artefacts. The salvage program recommended above would be guided by this ACHMP rather than an AHIP.

Section 1.3.1 lists two OEH Project requirements of the EIS of which this report will form part; namely:

> *The EIS must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the (development/project) to formulate appropriate measures to manage unforeseen impacts.*
>
> *The EIS must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material.*

Detailed procedures for these eventualities will be in the ACHMP which will frame policies for both unanticipated material culture finds, as well as human remains.

10.6 ARCHAEOLOGICAL DISCUSSION AND MANAGEMENT: SUMMARY

Within the Survey Area the current assessment has identified 25 artefact scatter sites and 34 isolated finds. In addition, 20 previously recorded sites have had their site boundaries altered to take into account findings from the survey. Beyond these sites there are a further 49 previously recorded sites within the Survey Area.

10.6.1 Survey and Test Excavation Results: Summary

This section examines site distribution, site features and site condition, as well as features from the artefact assemblage. These results show:

- The survey results agree with the predictive model and many of the previous archaeological surveys in the Survey Area in that large sites and / or sites showing complexity are mostly found along waterways;
- In the majority, only low density artefact scatters or isolated finds are located away from water;
- Redbank Creek has the densest concentration of occupation evidence (i.e. artefacts) with less dense artefact concentrations along tributaries and adjoining landforms;
- No locations within the Survey Area had benches of outcropping sandstone in a drainage line. This implies that grinding grooves are non-existent within the Survey Area;
- Sites along Redbank Creek demonstrated greater diversity and complexity than sites elsewhere within the Survey Area. Artefact exposures were biased towards the southern bank and site boundaries have become blurred from repeated camping episodes and/or the action of water movement;
- Site complexity diminishes with the size of the waterway so that artefact exposures on minor waterways exhibit little diversity in raw materials, less well-formed artefacts such as blades and less overall artefact numbers. Artefact exposures on the minor drainage lines tend to have more definite boundaries indicating less blurring of sites from repeated camping episodes;
- Many artefact scatters recorded during this assessment are in poor condition due to the effects of erosion: either gully erosion completely removing sites, or soil loss from sheet wash, both of which can displace artefacts and remove archaeological deposits;
- The artefact assemblage from the test excavation program shows that mudstone was the most commonly used stone type for knapping (55 per cent), followed by silcrete (44 per cent). In much smaller quantities, quartz and volcanics were also recorded as raw materials used in artefact manufacture. The surface survey recorded 69 per cent mudstone and 27 per cent silcrete: a greater predominance of mudstone artefacts when compared to the subsurface investigations;
- Most recorded artefacts tended to be small- to moderately-sized non-retouched flakes. These flakes were primarily non-cortical and a number of non-cortical cores were recorded, as well as examples of clusters of non-cortical flakes, seemingly struck from

the same core. The lack of artefacts at a primary stage of reduction indicates that this step in the manufacturing process was largely happening outside the Survey Area;

- Backed blades were recorded at several locations, as were scrapers, mostly small end scrapers. A ground-edge axe blank was recorded and some large scrapers: although large artefacts are rare in the assemblage;

- The types of artefacts recorded are very representative of other assemblages within the upper Hunter Valley. The percentage of backed artefacts and cores is similar to other investigations in the wider region. This implies that specialised activities, such as quarrying or large-scale tool manufacture, were not taking place within the Survey Area;

- Only stone artefact sites were recorded within the Survey Area. While some sites were probably always absent (such as grinding grooves or shelter sites) due to the lack of appropriate escarpments or sandstone shelving in creek lines, other site types such as culturally scarred trees or stone arrangements may well have once been present in the Survey Area but have possibly been removed during the area's agricultural use;

- The archaeological evidence suggests that long-term camping was not taking place in the Survey Area as large occupation camps are missing from the archaeological record currently, and have not been recorded previously. It is likely that more favourable long-term occupation areas existed nearby, but outside the Survey Area. Also lacking from the archaeological record are concentrations of artefacts away from waterways indicating that there was not a feature in the landscape (quarry / ceremonial site?) that was regularly visited, or at least, it was not associated with camping / stone knapping. Additionally, it does not seem that the Survey Area contained major pathways away from the waterways as well-used transit camps away from water are also missing from the archaeological record;

- The archaeological evidence does suggest that many sites date to the late Holocene Period and show Aboriginal occupation across all parts of the Survey Area with more repeated occupation along the larger waterways and briefer or more sporadic occupation along smaller drainage lines. It is suspected, like elsewhere in the region and the State, that this distribution pattern is reflective of hunting and foraging strategies, using the waterways as a focus, over a period of at least several thousand years; and

- The recording of a possible knapped glass artefact (at site UCL 12/2) possibly shows that traditional Aboriginal use of the Survey Area continued into the modern period.

10.6.2 Assessment of Scientific Significance: Summary

- Six sites are assessed as having low–moderate scientific significance: United OS-18; United OS-25; Red Bank Creek 27; Red Bank Creek 28; Red Bank Creek 5 and UC2/1.

- The remaining 122 sites were assessed as having low scientific significance.

- Low significance sites mainly consist of low density artefact scatters or isolated finds on landforms with thin A Horizon soils and little potential for further subsurface archaeological deposits.

10.6.3 Archaeological Management: Summary

The archaeological management proposed for the Survey Area divides all known Aboriginal sites into two categories.

The placing of a site in a particular category depends on its assessed scientific significance as this determines which research questions a particular site is likely to answer based on the site's size, nature, condition and location in relation to the Disturbance Area.

- Category 1 sites include all sites assessed as having low–moderate scientific significance, as well as Wambo PAD B and Wambo PAD T. This category consists of eight sites.
- Category 2 sites consist of the remaining 120 sites with an assessed low scientific significance.

Each of these categories will have a particular archaeological strategy applied to the archaeological salvage of the site.

These management recommendations are framed in the knowledge that on-going erosion continues to impact sites in the Survey Area and that a scientifically rigorous salvage programme is the best hope of gathering information before further artefacts, contexts and information are lost due to erosion.

In the face of the proposed works, it is hoped that the archaeological management strategy proposed here will ensure that management not only saves artefacts from direct impact but, within a research framework, our understanding of the archaeological record within the Survey Area will be enhanced.

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