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# Appendix E

Archaeological background

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## E.1 Regional context

Many contemporary Aboriginal cultures note their custodianship of the landscape since time immemorial. From an archaeological perspective, the first peopling of Australia by large groups of hunter gatherers occurred ~50 kilo annum (Bradshaw et al. 2019; O’Connell et al. 2018). The peopling of the continent was rapid, with sites such as Devil’s Lair (Western Australia), Warraty (South Australia), and Lake Mungo (New South Wales (NSW)) all occupied within a few thousand years of arrival (Bowler et al. 2003; Hamm et al. 2016; Turney et al. 2001). Genomic research has shown that following these initial explorations of the continent, regional populations or nomadic sedentism, was established by ~40 kilo annum (Tobler et al. 2017). These small populations were highly mobile, but remained within a broad spatial geographic area, dictated in general by the nature of resources and water availability. In the case of some of the arid parts of the continent, mobility encompassed thousands of square kilometres (Gould 1977), while major riverine corridors such as the Murray River had near permanent settlements (Pardoe 1995).

In NSW, the earliest evidence of Aboriginal people are human remains recovered from the lunette in Lake Mungo and dating to ~42 kilo annum (Bowler et al. 2003; O’Connell et al. 2018). The presence of red ochre covering the remains represents a society with significant cultural and symbolic complexity (Langley 2011). Nearer the coastal edge, the earliest populations were found at Cranebrook Terrace, near Penrith. Here, a handful of rudimentary stone tools were found in an alluvial unit, around 8 metres below the current surface, which were dated to ~40 to 45 kilo annum (Williams et al. 2017). However, it is not until ~35 kilo annum, that regional populations appear to have become established in the Sydney Basin, and which appeared to consist of small bands of people focussed mainly along major river systems, including the Hawkesbury Nepean, Parramatta, Georges and Hunter Rivers (Hughes et al. 2014; Williams et al. 2012, 2014). These rivers formed key ecological refuges that hunter gatherer groups used to survive major climatic events such as the Last Glacial Maximum (21±3 kilo annum) – a cool and arid climatic period. Well established archaeological models suggest populations experienced a major reduction in size (by as much as 60%), and settlement contraction and abandonment across much of the continent during this time (Veth 1993; Williams et al. 2013). Although, recent research suggests that the story may be more complex than this (e.g. Tobler et al. 2017).

The terminal Pleistocene and early Holocene (~18 to 8 kilo annum) was characterised by significant environmental change, notably the rapid inundation of much of the coastal shelf, resulting in the reduction of the continent by ~21% (~2 million square kilometres) (Williams et al. 2018), in tandem with improving climatic conditions – the Holocene climatic optimum (Williams et al. 2015a; Williams, et al. 2015b). More broadly, these conditions resulted in increasing population growth, expansion of ranging territories, increasing sedentism (longer patch residence time) and the beginnings of low level food production (e.g. aquaculture), and ultimately the initiation of social and cultural groupings observed in the late Holocene (Williams et al. 2015b). Within the Sydney Basin, a large number of sites are first initiated during this time, including Burrill Lake (~20 kilo annum), Bass Point (~17 kilo annum), and Loggers Shelter in Mangrove Creek (~11 kilo annum) (Attenbrow 2004; Bowdler 1970; Lampert 1971). This is also the case in the greater Blue Mountains area, where dated rockshelter sites in the area suggest that Aboriginal occupation extended as far back as 14,000 years ago, and potentially as early as 22,000 years ago (Stockton 1973; Stockton and Holland 1974).

More broadly, at this time we see a much broader range of archaeological site types occurring, such as the Roonka Flat burial ground on the banks of the Murray River, within which approximately 147 individuals were interred through the Holocene (Pate 1998), and the increasing use of marine resources. Many of the previous refuges were subject to abandonment or a restructuring of land use (Dortch 1979; Fitzsimmons et al. 2019). These activities suggest the ability to undertake large scale movements to mitigate environmental distress was becoming increasingly difficult and was addressed through diversification of hunter gathering behaviours and, at least in part, technological advances and investment (Williams et al. 2015b).



The late Holocene saw significant population increase, with hunter gatherers reaching their zenith of ~1.2 million at 0.5 kilo annum, a tenfold increase on Pleistocene levels (Williams 2013). Data suggests that the highest populations during this time were in the southeast of Australia. Williams et al. (2015b) suggest that this increase was likely a result of intensification of earlier technological advancements, including hafting technology, plant and seed processing, and localised landscape management (using fire), allowing climatic downturns to be successfully weathered. These included strong arid El Nino Southern Oscillation (ENSO) conditions between 4 to 2 kilo annum, and increasingly turbulent climatic conditions during the Medieval Climatic Anomaly (1.3 to 1 kilo annum) (generally wetter) and Little Ice Age (0.3 to 0.5 kilo annum) (generally drier) (Williams et al. 2010; 2015a). A result of these denser populations was decreasing freedom of movement and the formation of strong classificatory kinship systems, complex cultural and symbolic landscapes based on geographic totemism (the 'Dreaming'), distinctive graphic art systems, land rights in the form of ritual property, and formalized exchange networks (Williams et al. 2015a).

## E.2 A review of nearby archaeological investigations

### E.2.1 HTP North

#### i Hunter Transmission project: Heritage Risk Assessment (Umwelt 2023b)

As a precursor to the environmental impact statement (EIS) and related assessments (including this report), Umwelt was engaged by the Energy Corporation of NSW (EnergyCo) to prepare a desktop and high-level heritage risk assessment for the project (Umwelt 2023b). This assessment included a review of landscape and geomorphology, a targeted literature research, and the development of landscape analysis and predictive modelling. It identified a range of sites, places and values of the preliminary corridor, much of which has changed since the scoping report was submitted. It also provided over-arching guiding principles for the project, including avoiding sites of high value, minimising vegetation clearance, and the need to undertake extensive Aboriginal engagement.

In summary, the document outlined the following:

- Landscape and geomorphology
  - the project impact area encompasses 2 major river catchments: Hunter River and Lake Macquarie in HTP North/Central and HTP South, respectively. Cultural materials are well documented in valley floor and low-lying terrain in the vicinity of water features in these locales
  - the report highlights the potential for Pleistocene (>10,000 year old) soil profiles may be present in the general vicinities of Lemington to Milbrodale, and east to Scotts Flat and Westbrook
  - a detailed review of land disturbance was provided, which identified undisturbed, cleared/partially cleared, developed (easements) and developed (mining or other) areas. Overall, significant portions of HTP North have been cleared/partially cleared and developed, with undisturbed areas dominating HTP Central and HTP South.
- Predictive model
  - HTP North was considered to be dominated by alluvial landscapes of the Hunter River and major tributaries, and within which localised stratified cultural materials may be present. More recent occupation into the post-Contact period may also be present. Where bedrock is exposed in valley bottoms, sites such as grinding grooves and mature trees (with greater potential for cultural modification) may be present. HTP South in the vicinity of Dora Creek, Stony Creek and Cockle Creek are considered to reflect comparable environmental conditions

- HTP Central and HTP South are more characteristic of elevated sandstone country, within which steep sided valleys with cliffs, overhangs and other outcrops are prevalent. In relation to cultural materials, prominent ridgelines, rockshelters and associated art and/or deposits and grinding groove sites are all likely to be present.
- Targeted literature review
  - outlined that significant investigation has occurred primarily since the 1970s in HTP North, and included key themes such as initial peopling, occupation models, site patterning and typology
  - in terms of initial peopling of HTP North, the report outlines a small number of excavations at Glennies Creek, Wollombi Brook, Warkworth, Lemington, and Jerrys Plains, and which suggest a late Pleistocene – early Holocene (>7500 year ago) activity. While HTP Central has limited data, with Bobadeen 1 rockshelter near Cassilis dating to ~7700 year ago. Along the coast in HTP South, dates from Moffats Swamp and Swansea inlet range from ~14,000 years ago to the last ~2000 years ago
  - the report concluded that the majority of cultural assemblages dated to the mid-to late Holocene (i.e. <5000 years ago), and chronological information was extremely limited in HTP Central and HTP South
  - a large number of occupation models for the various regions was explored
  - it provides discussion on cultural heritage management, including avoidance of high value sites and places, cultural offsets, and with increasing importance of management of cultural landscape and ongoing connection to Country for the local Aboriginal community. They suggest that the level of cumulative loss in the HTP North will result in increasingly rare classifications for the remaining cultural assemblage within the region
  - there is a review of existing heritage databases, consideration of intangible values (primarily in the vicinity of Mount Sugarloaf outside the preliminary corridor), and national heritage listings in the general region. Notably, the report outlines previously documented sites within the Singleton Military Area, which has had limited access in the past. They identified 10 sites, including a series of significant grinding groove.

## ii Bayswater Water and Other Associated Operational Works (Jacobs 2019a)

In 2019, Jacobs Group (Australia) Pty Ltd (Jacobs) completed an Aboriginal cultural heritage assessment (ACHA) for infrastructure and water upgrade works for AGL Macquarie close to Lake Liddell in Muswellbrook NSW. The desktop assessment identified 14 previously documented sites within the project impact area, including open stone artefact sites (n=13) and a single hearth within 'BAYS AS and PAD11' (AHIMS #37-2-6143) (Jacobs 2019a). Highly significant artefact scatters of >500 artefacts have been recorded within the surrounding region south of the Mount Arthur Coal Lease, 6 kilometres north-west of the project impact area. Material types identified at the Bayswater Colliery, <10 kilometres north of the project impact area, included quartz, rhyolite, chert, mudstone, and 'tuff' with typologies encompassing backed artefacts, grinding stones, ground stone axes, and choppers- all characteristics of late Holocene (<5000 years) use (Jacobs 2019).

Soil landscapes within the Upper Hunter River suggest shallow residual and colluvial loams, and sands, along ridgelines and brown solodic soils located on lower slopes. Based on the desktop assessment of local sites, elevated landforms in proximity to watercourses were predicted to have a higher level of archaeological potential, these include bordering slopes, creek banks or flats, and terraces. As a result of transient use of the upper slopes, open artefact sites were expected to have low densities along ridgelines and hills, with higher densities in areas adjacent to watercourses, reflective of longer term and/or repeated use. Moreover, heavily disturbed contexts including imported fill were identified at sites within the Bayswater power station development area (Jacobs 2019).

Sites identified as part of the survey were located on rolling hills and low to medium gradient slopes. The report recorded high levels of visibility, and identified 23 additional sites encompassing isolated finds, artefact scatters (mostly low to moderate densities) and potential archaeological deposits (PADs). Material types included fine-grained materials of chert, mudstone, tuff, and silcrete. A single high density artefact scatter was identified, (BAYS AS and PAD05, n=135), and a previously identified high density scatter (#37-2-0063, n=>240), was presumed to be destroyed.

Management recommendations included undertaking a test excavation program within the vicinity of identified PADs as well as the surface collection of all artefacts impacted by the proposed works. Given the likelihood of identifying highly disturbed sub-surface contexts, this assessment allocated a low to moderate significance to all sites with further test excavation recommended to verify the potential impact of unidentified sites.

iii [Hunter Valley Operations mining complex continuation project ACHA \(EMM Consulting Pty Ltd 2022\), Addendum \(EMM 2023\)](#)

In 2022, EMM Consulting Pty Limited (EMM) completed an ACHA as part of the Hunter Valley Operations mining complex continuation project to allow mining operations to be extended to 2050 in the north and 2045 in the south, which was separated into 2 State significant development (SSDs) (Hunter Valley Operations mining complex north, SSD-118266810 and Hunter Valley Operations mining complex south, SSD-11826621) (EMM 2022). This was followed by an addendum to address comments raised during the submission of the environmental impact statement (EIS) (EMM 2023). The project impact area extends through the continuation project impact area.

The ACHA included the following activities:

- Consultation with 33 registered Aboriginal parties (RAPs) in accordance with Heritage NSW guidelines, and other project specific engagement strategies.
- A formal cultural values mapping study, which identified seven places of cultural value as advised by the Wonnarua traditional owners - Baiame's Cave (story place and archaeological site), Broke Cemetery (historic place), Loder/s Creek (archaeological place), Lookout Point (story place), Redbournberry Hill (historic place), St Clair Mission (historic place), and Wallaby Scrub Bora Ground (story place and archaeological site).
- Determined that much of the Hunter Valley Operations mining complex continuation project impact area was disturbed and/or rehabilitated (reshaped and revegetated) as a result of previous farming and approved mining, which has occurred in the locality for over 70 years. Remnant areas of natural topography within the study area were predominantly low to moderate gradient slopes with very occasional steep gradients, substantial flats and floodplains, specifically adjacent to the Hunter River and its associated tributaries or drainage lines. The majority of the soil landscapes were found to be characterised by duplex soils, which consisted of an upper A1 horizon and underlying B2 horizon.

- A review of existing archaeological data included 746 previously documented sites within the proposed disturbance areas. However, only 228 of these sites are extant (valid or partially destroyed), with the remaining 518 sites listed as destroyed or 'not a site'. The most common site type in the region were artefactual sites (95%), comprising isolated finds or artefact scatters, with lesser occurrences of rarer site types such as culturally modified trees (1%). Site distribution shows a strong correlation with proximity to water as well as elevated landforms such as ridgelines, spurs or terraces. Relatively few sites have been registered as featuring PAD (3%), likely reflective of skeletal and eroded soil profiles prevalent throughout the Hunter Valley.
- A 24-day field survey and 32-day test excavation across the Hunter Valley Operations mining complex continuation project impact area targeting specific sites and places. Approximately, 78 new sites (mostly artefact scatters), the majority of which were recorded on gently inclined slopes (n=39) and/or on, or adjacent to terraces overlooking watercourses (n=25). Following the survey, 12 locations were highlighted for test excavations. The test excavation program comprised 336 test pits to a generally shallow depth (~20 centimetres) and reflected duplex soil profiles. This excluded test pits within the Warkworth sand system, which reached depths of up to 95 centimetres in alluvial deposits. A total of 564 artefacts were identified from 106 test pits (31%) during the excavation, with extrapolated densities averaging to 6.59 artefacts per square metre.
- In addition, as part of the ACHA, excavation of previously recorded Aboriginal Heritage Information Management System (AHIMS) Site #37-2-1877 Carrington Mine Colluvial Deposit 1 (CM-CD1) -a significant colluvial deposit situated to the west of the study area and identified as part of the initial investigations of the Hunter Valley Operations mining complex site. The excavations were undertaken to further understand the deposit, and notably its age of formation. Subsequently, optically stimulate luminescence (OSL) dating focusing on a unit identified as the 'Older Stratum' (unit 5) was undertaken. Results from OSL dating confirmed the 'Older Stratum' of CM-CD1 was of significant age relating to the early Holocene and late Pleistocene periods (10,000 to 12,000 years ago), and the site was of high scientific (archaeological) and cultural significance. As a result, Hunter Valley Operations mining complex changed the mine plan to avoid the site.
- It was considered that the majority (84%) of identified sites were of low scientific significance, 7% were considered of low to moderate, 4% moderate, 4% moderate to high, and 2% high. Site types of low scientific significance included isolated finds (46%) and low density (<10) artefact scatters (43%). Sites of high scientific significance included high density artefact scatters with or without potential archaeological deposits (67%) and culturally modified trees (33%).
- The Hunter Valley Operations mining complex continuation project impact area has been subject to both natural and anthropogenic disturbance that will affect the survivability of cultural materials if present. For example, the potential for scarred trees is reduced by vegetation clearance activities removing mature specimens.
- A range of mitigation measures were proposed, including avoidance (active and passive) of 84 (28%) of identified Aboriginal sites, surface collection of 198 (65%), surface collection and salvage excavation of 19 (6%) Aboriginal sites, salvage excavation only of one (0.3%) Aboriginal site, and salvage and relocation of the scarred portions of two (0.7%) culturally modified trees. The report also included a range of socio-economic initiatives across key Closing the Gap themes including health, education, business, finance, employment, culture, and community to offset perceived harm.

Following submission of the EIS, Heritage NSW provided comment on the ACHA. These comments were focussed on the suitable identification and management of Warkworth sand system deposits and associated sites, and clarification of a range of site data, existing and future management for the project. This resulted in an extensive addendum to the ACHA. The key findings of the addendum included:

- A detailed geomorphological review of the Warkworth sand system that may be present within the study area. It was considered that the Warkworth sand system was generally found south of the project in the vicinity of Wollombi Brook and Hunter River. It highlighted two sites, Malabar Burnham Wood Site I (#37-6-0166) and Hunter Valley 1: Maryville Malabar Site N (#37-5-0063) that were in the project impact area and had characteristics consistent with the Warkworth sand system. A newly identified area, HVOCP TR213-AS1 (#37-3-1626), was also documented. CM-CD1 (#37-2-1877) was also consistently referenced as of Pleistocene age (>10,000 years ago), and further information on the archaeological excavations undertaken by the project to validate this is presented. An important finding, however, was that while the Warkworth sand system and colluvial units of CM-CD1 (#37-2-1877) have been identified as Pleistocene, cultural assemblages recovered within them often have Holocene (<5000 years ago) typology and characteristics. The ability to disentangle the mixing of older and younger cultural assemblages within these types of deposits was typically achieved on a project specific basis and in some instances was not always proven possible.
- Further consideration of the cultural assemblage was also undertaken based on additional information and modifications to the project design. Of the 315 Aboriginal sites documented, ~27 were considered to contain high densities of stone artefacts, cultural materials stratified in aeolian/colluvial units, and/or culturally modified trees, and indicative of more intense visitation and occupation in the past (see Table E.1). Such sites were typically assigned higher levels of significance in previous and regional assessments. A further 4 sites that have been destroyed by development activities were also noted as having met these criteria.
- Ultimately, 11 sites were considered of high significance, including 5 culturally modified trees, 3 sites containing stratified and potential or demonstrated Pleistocene cultural deposits, and 3 high-density artefact scatters with some potential for stratified cultural deposits. Approximately, 16 sites were assigned a moderate significance and typically characterised as moderate to high density stone artefact scatters constrained to shallow texture contrast soil profiles. The remaining 288 sites typically reflect isolated or low-density stone artefacts that are consistent with the broader background scatter found across the Hunter Valley. The report ultimately combined these latter sites into a single cultural assemblage encompassing the study area.
- Of the 27 sites, 11 were proposed for impacts, with the remainder being avoided through project re-design. The report found that potential impacts to HVOCP TR213-AS1 (37-3-1626) would be considered to have regional cumulative impacts, since the site was part of the finite Warkworth sand system. The loss of remaining sites was considered to have some local cumulative loss, but similar sites were more common in the Hunter Valley and elsewhere.

Of note for the purposes of the project are the descriptions of Malabar Burnham Wood Site I (#37-6-0166) and Hunter Valley 1: Maryville Malabar Site N (#37-5-0063) near which the project impact area is proposed. EMM (2023: 15-16) outlined these as follows:

- Cheshunt dune: Malabar Burnham Wood Site 1 (37-6-0166)
  - Archaeological and geomorphological investigations were undertaken on the Cheshunt dune located immediately adjacent to the southern bank of the Hunter River; this site is situated within the project impact area (immediately north of the Cheshunt Pit within Hunter Valley Operations mining complex south). The surface of the dune demonstrated the presence of both Aboriginal and European objects. Excavation included hand, shovel and backhoe pits dug at 11 locations. A total of 822 stone artefacts and 429 European artefacts were identified during the excavations. OSL samples were collected from the sand dune at 1.25 metres and 2.25 metres below the ground surface and the dates returned were 83,000 and 88,000 years old, respectively. The archaeological material was identified at 0.9 metres, at its deepest extent, and it was concluded that while the dune was formed in the late Pleistocene, and prior to human occupation of Australia, the artefacts were likely to be Holocene in origin and had moved downwards from their original context due to bioturbation.
- Hunter Valley 1: Maryville Malabar Site N (37-5-0063)
  - Malabar Burnham Wood Site 1 (37-5-0063) is an open stone artefact scatter situated within an aeolian source bordering dune. The site was situated ~200 metres east of the Hunter River within the existing and approved disturbance area of Hunter Valley Operations mining complex north. Although dating of the site was not undertaken geomorphological assessment indicates that the deposition of the sands was likely to have occurred in the late/terminal Pleistocene or early Holocene. The site was noted to have been subject to several post-taphonomic alterations such as ploughing, bioturbation, rabbit burrowing, deflation and tree fall. These processes have made it difficult to determine whether the artefacts recovered were indicative of discrete knapping floors or the accumulation of material at certain locations to the site formation processes.
  - Archaeological salvage excavation across the site recovered a total of 4633 stone artefacts, and of these a sample of 1417 were subject to further analysis. The assemblage composition was determined to be typical of artefact scatters across the Central Lowlands and reflect initial reduction and production of occasional backed flakes removed from burinates. Although sediment samples were collected for thermoluminescence dating, it was found that the sediments were unsuitable for dating. Ultimately the site was assigned as having moderate scientific significance based on its known (large) size, location, and high densities of artefacts recovered.

While some distance from the project, the addendum also summarised archaeological investigations by Scarp Archaeology (2009) at Warkworth, and which provide some of the most extensive information on the Warkworth sand system (EMM, 2023: 16):

- W14 Sandsheet (#37-6-0946)
  - Archaeological excavation of a sand sheet adjacent to Sandy Hollow Creek at Warkworth was completed by Australian Museum Business Services (AMBS) (2002) and later by Scarp Archaeology (2009). The sand sheet was located along Sandy Hollow creek approximately 5 kilometres south of the current project impact area.

- Scarp Archaeology completed an archaeological assessment on behalf of Rio Tinto Coal Australia for the proposed extension of the Warkworth Coal Mine approximately 12 kilometres west of Singleton. The assessment completed archaeological investigation of an exposed area of Warkworth Sands immediately west of the working open cut mine. The sand body at this location was approximately 500 metres (north to south) by 200 metres (east to west) and up to 4 metres in depth. Previous assessment of the area was completed by AMBS (2002), and identified stone artefacts associated with OSL age determinations of at least 14,000 years old. Scarp was engaged to undertake further research of the area.
- Scarp noted that the Warkworth sands were present along the gently sloping western bank of Sandy Hollow Creek (minor tributary of the Hunter River) 5 kilometres east of Wollombi Brook, and 5 kilometres south and west of the Hunter River. Due to the uniform grain size of the upper sand unit Scarp determined that the sand sheet was likely to form part of the Warkworth sand system – a larger broader series of aeolian deposits. While the origin of the sand is not ultimately known it was assessed as being most likely associated with Wollombi Brook, the Hunter River or could be representative of a localised breakdown of outcropping sandstones (Scarp Archaeology 2009: 23).
- AMBS excavated 10 pits in the area and recovered 213 stone artefacts from the sand sheet (2002). Excavation within Pit 9 identified 8 artefacts associated with an OSL age of  $13.7 \pm 0.3$  ka (ANU 1580, at 60 centimetres depth) and 1 artefact was identified at 150 centimetres below the ground surface (Spit 15) and was located beneath ANU 1582, at 125 centimetres depth which had an OSL age of  $47.4 \pm 2.0$  kilo annum (Scarp Archaeology 2009: 26).
- Subsequently, Scarp Archaeology investigated the Warkworth sand system area by completing large open area excavations (5 metre x 5 metre pits) across 4 locations (trenches 1 to 4). Comprehensive information was presented for each trench and described the stratigraphic profiles and location of OSL dating samples taken, cultural material recovered, and the overall results of the dates obtained from the OSL samples in relation to the cultural material identified.
- Their study included geomorphic assessment, a ground penetrating radar (GPR) study, OSL single grain dating samples, charcoal dating, and technical analysis of the recovered stone artefacts. From the results of the excavation and these subsequent studies it was found that there was an upper and lower stone artefact concentration across the sand sheet area. The upper concentration is considered to be 1000 to 2000 years old and demonstrates the presence of backed artefact typologies characteristic of Holocene stone artefact assemblages of the wider region. The lower concentration is considered to be 8450 to 14,100 years old, and the stone artefacts were assessed as not having any diagnostic technological indicators.
- The OSL data and interpretations were able to demonstrate significant disturbance to the area from bioturbation, and it was inferred that the previous dates collected for the site by AMBS were not reliable and gave misleading older dates due to mixing of older sands and are unlikely related to stone artefact deposition. It was assessed that the artefacts recovered are most likely all less than 10,000 years in age.



- The overall conclusions of the study were that stone artefact frequency was very low averaging 7 per cubic metre and substantial bioturbation of sand was demonstrated (especially in the upper 1 metre). Despite the substantial movement of sand, sand deposition was reconstructed and spanned over 30,000 years. Any sands accumulating prior to this time most likely represent buried fluvial paleochannels. The bioturbation was likely caused by tree root growth, tree collapse, burrowing insects, burrowing mammals (wombats) and fire/rain. The substantial disturbance limited the reliability of dating the associated stone artefacts. Although the lower concentration of artefacts was bracketed by dates of 8400 to 14,100 years, it was inferred that the artefacts are more likely to be less than 10,000 years old. The initial OSL ages which suggested that stone artefacts were likely to be over 14,000 years old and up to 45,000 years old were considered unreliable.

The addendum report also included further detail on potential post-approval mitigation measures, including the large-scale archaeological salvage excavation of key deposits and recovery of culturally modified trees.



**Table E.1**      **Aboriginal sites identified by EMM (2023) as being indicative of past occupation, and generally of high or moderate scientific significance. Those highlighted are within or in close proximity to the project impact area**

AHIMS #	Site name	Site type	Site status	Artefacts (n)	Site description
37-2-0796	HC20	Artefact scatter	Valid	557	Originally recorded in 1995 (ERM) as an artefact scatter consisting of 557 mudstone, silcrete, chert and quartz artefacts. The site is south of Dam E along a drainage gully and a contour bank. Artefact types are flakes and flaked pieces. No subsurface potential identified. The assessment concluded site to have "some" degree of archaeological/scientific significance.  In 2000 (HEH) a geomorphological study concluded only small amounts of artefacts were eroding out of the unit A deposit which was generally shallow (<5 cm) across the area in both colluvial and alluvial contexts. The geomorphology report concluded that none of the identified sites had the potential for deep subsurface older deposits.
37-2-1504	Carrington Mine CM 1	Artefact scatter with potential archaeological deposit	Valid	214	Originally recorded by ERM (1999a), Carrington Mine CM1 is an artefact scatter of 214 artefacts, and including silcrete, mudstone, chert, basalt, quartz and petrified wood raw materials. The site commenced at the edge of a culvert under Lemington Road and proceeded along the banks of the creek for approximately 300 m, across an area of recent cultivation. The site has research potential due to its association with sites CM2 and CM-CD1 and its potential to contain subsurface cultural material associated with the minor creek line.
37-2-1505	Carrington Mine CM 2	Artefact scatter	Partially destroyed	~70,000	This site was considered to reflect a large quarry on a ridge over-looking CM-CD1. The site has been partially destroyed through mining activities, with only a small amount remaining within a buffer established around CM-CD1.
37-2-1506	Carrington Mine CM 3	Artefact scatter with potential archaeological deposit	Valid	42	Originally recorded by ERM (1999a), Carrington Mine CM 3 is an artefact scatter approximately 60 m long containing 42 artefacts, including 37 silcrete, 2 mudstone, 2 chert and 1 petrified wood. Most artefacts were in a small stone working area approximately 10 m x 5 m, running parallel with main drainage line. Artefacts were confined to the low to basal slope from a low ridge.
37-2-1544	Carrington Mine CM 41	Potentially culturally modified tree with stone artefacts	Valid	-	Originally recorded by ERM (1999a), Carrington Mine CM 41 is an artefact scatter and potential culturally modified tree, showing the removal of a narrow slab of bark of a narrow-leafed Ironbark. Artefacts were found around the base of the tree including a quartz core chopper, a quartzite core, a silcrete core chopper, and 23 silcrete flakes and flaked pieces. A second tree (Slaty Gum) ~75 m from the first tree bore a similar style of scar. A secondary trunk was also removed below the scar. Artefacts were found around the base of this tree, including 15 mudstone flakes or flaked pieces and 6 silcrete flaked pieces.
37-2-1877	CM-CD1	Archaeological Deposit	Valid	-	This site consisted of a 450 m cultural deposit adjacent an unnamed tributary of the Hunter River. The site consists of a colluvial deposit dating between 9–16,000 years ago. Recent excavations found a low density of cultural materials throughout the sequence.

AHIMS #	Site name	Site type	Site status	Artefacts (n)	Site description
37-2-6497	HVOCP TR47-AS2	Artefact scatter with potential archaeological deposit	Valid	92	<p>High density artefact scatter comprising &gt;20 mudstone and silcrete flakes and core fragments in areas of exposure on the southern bank of Parnells Creek. Artefacts are highly likely to extend beyond areas of exposure but could not be identified due to poor visibility. Areas surrounding Parnells Creek identified as retaining subsurface archaeological potential and subject to test excavation.</p> <p>Test excavations confirmed moderate density of subsurface deposits which declines with increasing distance from Parnells Creek. Average artefact density of 7.5/m<sup>2</sup> were encountered.</p>
37-2-6507	HVOCP TR104-AS1	Artefact scatter with archaeological deposit	Valid	4	<p>Low density artefact scatter comprising two mudstone flakes, one mudstone scraper, and 1 possible broken axe blank. Area identified as having subsurface archaeological potential and to be subject to test excavation with particular focus on stream banks adjacent to unmapped ephemeral creek line located 50 m to the south.</p> <p>Test excavations confirmed high density but shallow subsurface deposits. Approximately, 21 artefacts were recovered from three tests pits in the immediate vicinity of TR104-AS1.</p>
37-2-6514	HVOCP TR47-AS3	Artefact scatter with potential archaeological deposit	Valid	86	<p>High density artefact scatter comprising &gt;40 mudstone and silcrete flakes and core fragments in areas of exposure on the northern bank of Parnells Creek. Artefacts are highly likely to extend beyond areas of exposure but could not be identified due to poor visibility. Areas surrounding Parnells Creek identified as retaining subsurface archaeological potential and subject to test excavation.</p> <p>Test excavations confirmed moderate density of subsurface deposits, which declines with increasing distance from Parnells Creek. Artefact density of 9.2/m<sup>2</sup> were encountered.</p>
37-2-6519	HVOCP TR105-AS1	Artefact scatter with potential archaeological deposit	Valid	4	<p>Low density artefact scatter comprising two mudstone flakes and two silcrete flakes identified within incised, eroded section of ephemeral stream bank. The artefacts are considered to have eroded from soil profile, with adjacent areas of stream bank identified as retaining subsurface potential and subject to test excavation.</p> <p>Test excavations confirmed high density but shallow subsurface deposits. Approximately, 8 artefacts were recovered from three tests pits in the immediate vicinity of TR105-AS1.</p>
37-3-0449	LID6	Artefact scatter	Valid	36	<p>Originally recorded by Umwelt (2001), LID6 is an artefact scatter located on a small forked drainage depression associated with Bayswater Creek. The site has been exposed by minor gully erosion and artefacts appear to be eroding from the A1 horizon or are sitting on top of the B2 horizon. A total of 36 artefacts were recorded in a discontinuous scatter along a 50 m length of the drainage depression. This feature consists of seven silcrete flakes and flaked pieces which probably relate to the same knapping event. Artefact types include flakes, flaked pieces, cores and a retouched flake. The predominant raw materials are silcrete and mudstone, with quartz and chert also occurring.</p> <p>EMM (2022) assessed that there remained the potential for shallow subsurface deposit to be retained in areas outside of the channel bed.</p>

AHIMS #	Site name	Site type	Site status	Artefacts (n)	Site description
37-3-1069	REA197	Artefact scatter	Valid	50	<p>Originally recorded by Umwelt (2009), REA197 is an artefact scatter located on the west bank of a 2nd order tributary of Bowmans Creek less than 45 m from the stream channel (and 50 m north of the confluence with a further 2nd order tributaries). The site is situated on a gently inclined slope with an outlook to the northwest and contains 50 artefacts. Vegetation within and surrounding the site is dominated by introduced and native grasses/weeds. The site boundary is defined by surface artefact distribution (300 m<sup>2</sup>) across an area with 10 per cent visibility with a centralised exposure of 30 m<sup>2</sup>.</p> <p>The site is located along a fenceline with an adjoining graded vehicle access track. The site has also been impacted by vegetation clearing and grazing, revegetation, active sheetwash erosion and bioturbation (ants' nest). These disturbances have acted to remove the A1 horizon and to have exposed a relatively deep A2 soil horizon of more than 20 cm. The artefacts within the site are eroding from the intact A2 soil profile.</p>
37-3-1618	HVOCP TR195-AS1	Artefact scatter with potential archaeological deposit	Valid	5	<p>Low density artefact scatter comprising 4 mudstone flakes and one silcrete flake, identified on ant nest at edge of casuarina forest. It was considered likely that more artefacts present within vicinity but not identified due to poor visibility.</p> <p>Area includes a confluence of Hunter River and Bowmans Creek and was identified as retaining subsurface archaeological potential. Test excavations confirmed high density subsurface cultural materials.</p>
37-3-1619	HVOCP TR195-AS2	Artefact scatter with archaeological deposit	Valid	310	<p>Moderate density artefact scatter extending downslope across an area of approximately 2500 m<sup>2</sup> with &lt;25 artefacts primarily of mudstone and silcrete identified in small exposures along access track and scalds. It was considered likely that more artefacts were present within vicinity but not identified due to poor visibility.</p> <p>The site includes a confluence of Hunter River and Bowmans Creek and was identified as retaining subsurface archaeological potential and to be subject to test excavation. Test excavations confirmed very high density subsurface cultural materials (&gt;300 artefacts) associated with blade manufacturing site at this locale.</p>
37-3-1626	HVOCP TR213-AS1	Artefact scatter with potential archaeological deposit	Valid	161	<p>High density artefact scatter identified within large exposure at edge of terrace overlooking broad floodplains of the Hunter River, ~500 m to the north. Wide variety of artefact types including &gt;20 flakes, cores, blades, and tools made from mudstone, basalt, silcrete and quartz. This was Identified as an area of subsurface archaeological potential.</p> <p>Test excavations confirmed moderate to high density subsurface deposit across the terrace and hillslope with approximately 17.4 artefacts/m<sup>2</sup>. The deposits exhibited characteristics of the Warkworth sand system, although were typologically of Holocene age.</p>

AHIMS #	Site name	Site type	Site status	Artefacts (n)	Site description
37-3-1628	HVOCP TR178-ST1	Culturally modified tree	Valid		<p>Large Narrow-leaved Red Ironbark displaying two scars – one on the western face (Wound 1) and one on the northern face (Wound 2). Specialist inspection confirmed likely cultural origin of both Wound 1 and Wound 2.</p> <p>Wound 1 is a triangular becoming asymmetrical scar extending from ground to 256 cm and 40 cm at widest at base and comprising 2 successional wounding events occurring at the same location at different times: an initial inner wound and an outer secondary wound. The initial wound is &gt;120 to &lt;200 years old and the secondary wound is &gt;120 to &lt;150 years old. Wound 1 initial and secondary wounds are highly likely to be of Aboriginal cultural origin likely relating to reworking and opening of the hollow trunk possibly to hunt possums.</p> <p>Wound 2 is narrow, linear almost occluded, symmetrical scar. The wound is likely to have been up to 30 cm x 30 cm from the remaining measurable dimensions, but this is unable to be determined. Subject to the extent of wounding present, its location on the trunk and the depth of the wound, it is expected to be connected to Wound 1 and its cultural practices therefore is highly likely to be of cultural origin.</p>
37-3-1629	HVOCP TR212-ST1	Culturally modified tree	Valid		<p>Large Narrow-leaved Red Ironbark displaying two narrow elongated scars – one on the southern face (Wound 1) and one on the northern face (Wound 2). Specialist inspection confirmed likely cultural origin of Wound 1:</p> <p>Wound 1 is a narrow oval, symmetrical scar comprising two successional wounding events occurring at the same location at different times: an initial inner wound and an outer secondary wound. The initial inner wound is of likely cultural origin due to the age of the tree and undertaken up to 250 years ago. The secondary wound appears to be the result of an abrasion impact event from farm plant equipment or a truck approximately &gt;75–100 years ago.</p> <p>Wound 2 is a broad, symmetrical oval shape scar resulting from of an abrasion impact event from farm plant equipment or a truck approximately &gt;75–100 years ago.</p>
37-3-1634	HVOCP TR189-AS2	Archaeological deposit	Valid	33	No surface artefacts identified due to poor visibility, however test excavations confirmed high density shallow subsurface deposit with 33 artefacts recovered from five test pits (~26/m²). The site extent aligns with a hillcrest landform.
37-3-1635	HVOCP TR216-ST1	Culturally modified tree	Valid	-	<p>Large narrow-leaved red ironbark displaying one narrow oval, symmetrical scar on the northern face. The tree was in poor health, with complete loss to the primary crown and bark, and the living part of the tree limited to a secondary limb and adjoining trunk on the north east side of the tree. There were no cultural attributes, such as tool marks, present on the surface.</p> <p>As a precautionary measure, the tree was identified as cultural.</p>
37-5-0047	Malabar Site H Burnham Wood	Artefact scatter	Partially destroyed	50	<p>Originally recorded by Brayshaw (1981), Malabar Site H Burnham Wood is an extensive artefact scatter, with artefacts over an area of ~900 m x 400 m on an elevated slope adjacent to the Hunter River. The artefacts are visible on land that has been ploughed and where vehicle tracks and cattle have cut into the surface soil.</p> <p>Site was salvaged under AHIP 798/SZ315. Reinspection of the area at a later date identified dozens of remaining surface artefacts.</p>

AHIMS #	Site name	Site type	Site status	Artefacts (n)	Site description
37-6-0166	Malabar Burnham Wood Site I	Archaeological deposit	Partially destroyed	829	An aeolian dune deposit where 829 artefacts of Holocene age were recovered from 1.25–2.25 m below surface. A portion of this site has been destroyed by the existing mining operations.
37-5-0571	PAD 1 (Doyles Creek)	Potential archaeological deposit	Valid	-	Originally recorded by MCH (2009) PAD 1 (Doyles Creek) encompasses an area that extends 100 m from the Hunter River heading west. There are little disturbances and A horizon remains, thus making it ideal as an area for past occupation and increased likelihood of surviving cultural materials.  Reviewing site card information it appears as though the registered location of the site is incorrect, with report mapping showing the site on the western bank of the Hunter River. PAD 1 (Doyles Creek) was inspected as part of EMM (2022). The area was heavily overgrown with invasive weeds, and no cultural materials were observed.
37-6-3024	HVO-1656	Culturally modified tree	Valid	-	This site was originally recorded by Scarp Archaeology in 2011. The site is a dead standing gum. No further information is available within the literature.
37-6-3250	HVO-51	Artefact scatter with potential archaeological deposit	Valid	40	Originally recorded by HLA Envirosciences (2006), this site is an artefact scatter comprised of ~40 silcrete flakes and flaked pieces (potential knapping event) eroding out of an anthropogenically made drain. The site is located in association with an access road, anthropogenically made drainage channel and 1st order creek. Importantly, this site was located in a vertical section of the anthropogenically made drainage channel between a truncated B2 horizon and the colluvial layer above. The site has the potential to provide stratigraphic and temporal information for this and associated sites.
37-6-3251	HVO-52	Artefact scatter with potential archaeological deposit	Valid	50	Originally recorded by HLA Envirosciences (2006), this site is an artefact scatter consisting of 50 or more flakes of silcrete, quartz and chert and 1 silcrete multi-platform core, possible knapping floor. The site is located in association with an access road, anthropogenically made drainage channel and 1st order creek. The site is thought to directly relate to HVO-51 for both surface and subsurface material. The site consists of a flat area running between the access road and 1st order creek.
37-6-3294	HVO-98	Artefact scatter	Valid	90	Originally recorded by HLA Envirosciences (2006), this site is an artefact scatter comprised of 90+ flakes of silcrete, chert and quartz, 1 hammerstone of silcrete, 1 multi-platform core of chert. The site is located in an extensive exposure between the 1st order creek and the access road.
37-3-1649	HVOCP TR195-AS3	Artefact scatter	Valid	35	A moderate density sub surface artefact scatter extending downslope across an area of ~100 m x 50 m with <35 artefacts observed. The site includes an area on the confluence of Hunter River and Bowmans Creek identified as retaining subsurface archaeological potential and subject to test excavation.  Test excavation confirmed very high-density subsurface finds (>300 artefacts) associated with blade manufacturing site to the immediate north.

In 1995, ERM Mitchell McCotter Pty Ltd (ERM) completed an archaeological and anthropological assessment of the proposed Howick Mine Lease Authorisation 72 located approximately 1.2 kilometres northwest of the project impact area. During field investigations, approximately 10% of the total study area (800 hectares) was surveyed with vegetation coverage high at the time of survey (70%) resulting in low surface visibility.

A total of 3462 artefacts across 26 open artefact scatter sites (HC1 to HC26) were recorded, noting the highest densities were identified along drainage lines. The majority of sites averaged approximately 50 artefacts, with only 4 sites having <10 artefacts. Six sites had between 100 to 500 artefacts, and 1 site contained over 1000 artefacts (HC17). Artefact types were predominantly flake and flaked pieces; however, details are not consistently presented in the report. Raw materials were predominantly mudstone and silcrete, with smaller quantities of quartz, chert, porcellanite, and quartzite (ERM 1995). HC17, a high-density artefact scatter and a series of knapping floors, was determined to have the highest significance for its potential to contribute to understandings of stone tool manufacture.

The assessment recommended a consent to destroy application be made for 19 of the 26 sites identified, whilst further investigation of HC15 to HC18, HC20, HC21 and HC23 was necessary to determine significance. Upon review of the assessment, NSW National Parks and Wildlife Service (NPWS) determined that the documentation was not sufficient to consider the significance of sites and whether conservation or consent to destroy was supported. As a result, further assessment was recommended.

#### v Howick Coal Mine Archaeological Site Assessment (AMBS 2000, 2001)

In response to NPWS recommendations, Australian Museum Business Services (AMBS 2000) were engaged to reinvestigate sites HC21 to HC26 previously recorded by ERM (1995). The aim of the assessment was to record additional site information particularly in relation to artefact assemblages of the previously recorded sites, as well as to inspect an additional area in the southern portion of the proposed West Pit in comparison with sites recorded within the adjacent Carrington Mine.

Previously recorded sites HC21, and HC23 to HC26 were reassessed; however, HC22 could not be relocated. One additional site, HC101, was also recorded. The survey recorded a total of 179 artefacts which appeared in low to very low densities across the 6 sites. Artefact analysis recorded general similarities in terms of raw materials and artefact types, with the primary difference between assemblages being the presence of several sandstone grindstone fragments at HC21 and HC24. A geomorphological study, used to assist in the assessment of identified sites, concluded only small amounts of artefacts were eroding out of the Unit A deposit which was generally shallow (less than 5 centimetres) across the area in both colluvial and alluvial contexts (HEH 2000). The geomorphology report concluded that none of the identified sites had the potential for deep subsurface older deposits such as those identified at Carrington. Salvage recommendations of the report included surface collection of all sites, with grader scrapes to be conducted at HC21 (AMBS 2000).

Salvage via surface collection and grader scrape excavation was subsequently undertaken at sites HC21, HC23, HC24 and HC101, recovering a total of 644 artefacts (AMBS 2001). HC21 was interpreted as a residential base camp, where analysis of the assemblage determined a range of activities including blade manufacture. Use wear and residue analysis identified plant, wood and skin working occurred at the site, and microscopic examinations of sediment samples revealed a phytolith assemblage that reflects the modern vegetation of open woodland and grassy understorey. The remaining sites contained lower densities of artefacts and analysis indicated likely intermittent short-term use (AMBS 2001).

Of the 26 sites originally recorded by ERM (1995), 21 sites are now listed as destroyed in AHIMS. HC15 (#37-2-0791) and HC18 (#37-2-0794) are listed as partially destroyed in AHIMS in accordance with impact permit 4050, and HC20 (#37-2-0796), HC24 (#37-2-0800) and HC25 (#37-2-0801) remain valid. Additionally, HC101 (#37-2-1884) recorded by AMBS in 2001 is listed as destroyed in AHIMS.

Between 1981 and 1989, Helen Brayshaw completed archaeological investigations of proposed extension areas to the Howick-Liddell Open Cut Coal Mine (now West Pit), located 4 kilometres north-west of the project impact area. The 1981 phase of the assessment covered a large area located south of the Liddell Power Station and the New England Highway. Nine open artefact scatter sites, designated A to I, were recorded (Brayshaw 1981). One site was identified on Davis Creek, with the remaining sites identified along Parnells Creek and its tributaries. Seven of the sites contained <10 artefacts, two sites contained <20 artefacts, and 1 site contained up to 100 artefacts.

In 1983, Brayshaw surveyed an additional 400 hectares area with most of the landscape appearing to have been previously cleared for grazing and dam construction off small tributaries (Brayshaw 1983). Two sites, designated J and K, were recorded as a result of pedestrian and vehicle survey. Site J was identified on an eroded western bank of Parnells Creek and was comprised of 5 mudstone flakes in a 50 metre x 2 metre area. Site K, identified in a gully junction on a tributary of Farrells Creek, was comprised of five mudstone, silcrete and quartz flakes within a 15 metre x 12 metre area.

In 1989, Brayshaw surveyed an additional 180 hectares area that had been previously cleared but had prevalent regenerative growth. Six sites, labelled L to Q, were recorded, in addition to further artefacts associated with previously recorded site K. All sites were artefacts scatters, with site L estimated to contain between 100 to 150 artefacts. Of a total of 135 artefacts recorded at the sites, 53% were silcrete, 30% mudstone and 14% quartz (Brayshaw 1989). Artefact types included mostly unmodified flakes and flaked pieces, with no backed artefacts or diagnostic types identified. It was considered 'unlikely that more detailed investigation of these particular sites would add significantly to the information recorded' (Brayshaw 1989). Therefore, it was recommended that consent to destroy could be applied for without further archaeological investigation.

Of the 17 sites identified throughout these investigations (1981, 1983, 1989) the majority of sites are listed as destroyed in the AHIMS database, with the exception of Site Q (#37-2-0528) which remains valid.

#### vii Hunter Valley Operations mining complex West Pit Dam 17 (CQCHM 2016; HVO 2017; Veritas 2017)

In 2017, Hunter Valley Operations mining complex prepared an ACHA to support an Aboriginal heritage impact plan (AHIP) application for Aboriginal sites to be impacted by the relocation and re-establishment of West Pit Dam 17 at HVO. Cultural heritage investigations of the West Pit Dam 17 area were previously undertaken in 1999 (ERM), 2003 (AMBS), 2005 (ERM) and 2016 (CQCHM). The West Pit Dam area was granted a Section 90 Consent to Destroy (2086) in 2004, with salvage collection and excavation activities conducted in 2005 (ERM). However, additional material was subsequently identified in the area, and as the previous AHIP had expired, a new AHIP application process was required.

The earliest documented archaeological assessment which included portions of the Hunter Valley Operations mining complex West Pit Dam 17 area was undertaken by ERM (1999) for the proposed Howick East Expansion Area. The survey area that corresponded with the current West Pit Dam 17 area was found to be extensively disturbed by construction of a dam and coal conveyer. From these investigations, 2 sites were identified in the West Pit Dam 17 area: HEE1 (#37-2-1964) comprising 2 artefacts in an eroded area of a tributary of Farrells Creek; and CUM41 (#37-2-0805): a large scatter along Farrells Creek.

In 2003, AMBS completed archaeological investigations of the proposed West Pit Extension area, of which the southernmost 20 hectares contained the West Pit Dam 17 area. One additional site, artefact scatter WPE-1 (#37-2-2007) was identified by this assessment. Whilst the site had been disturbed by erosion and dam construction, it was assessed as being of low to moderate archaeological significance due to the high number of artefacts (>437) including flakes, cores and axes, as well as knapping floor features and PAD requiring salvage excavation (AMBS 2003).



In 2005, ERM (2005) conducted salvage of the Aboriginal sites within the West Pit Extension Area under AHIP 2086, including site WPE-1 (#37-2-2007). The salvage involved surface collection of artefacts as well as a grader scrape and 3 hand excavated pits. The salvage recovered a total of 828 artefacts, with the majority (n=715) from surface collection, and 113 artefacts from subsurface deposits.

Since the completion of the salvage work in 2005, Aboriginal cultural material was identified at the former WPE-1 site by Coal and Allied personnel, however the previous AHIP for the site had subsequently expired.

In 2016, Central Queensland Cultural Heritage Management Pty Ltd (CQCHM) were engaged to complete a comprehensive and systematic re-assessment of the Hunter Valley Operations mining complex West Pit Dam 17 area. A total of 12 loci of artefacts were recorded during this assessment and subsequently registered as individual sites, HVO-1780 to HVO-1791, (#37-2-5360 to #37-2-5370 and #37-2-5384). Consistent with previous archaeological assessments of the area, potential for sub-surface material was deemed to be low due to the shallow and unstratified nature of the deposit.

In 2017, Hunter Valley Operations mining complex prepared an ACHA to support an AHIP application for the remaining Aboriginal sites to be impacted by the relocation and re-establishment of West Pit Dam 17. The ACHA summarised previous investigations and did not involve any additional fieldwork (HVO 2017).

An AHIP (4089) was later obtained for 12 remaining sites within the West Pit Dam 17 area, and salvage of the sites was conducted by Veritas (2017). Salvage included surface collection, 5 grader scrapes and 21 test pits. Due to poor ground surface visibility only 10 of the 12 previously recorded sites, as well as an additional three new sites, were subject to surface collection (Veritas 2017). Five grader scrapes approximately 25 metres long were completed in proximity to where the greatest concentrations of surface artefacts had been identified, followed by 21 test pits which were then machine dug within the grader scrapes to a depth of 15 to 20 centimetres where the B horizon was reached. The salvage resulted in collection of 259 surface artefacts, and recovery of 326 artefacts from grader scrapes and test pitting. HVO-1780 to HVO-1791, (#37-2-5360 to #37-2-5370 and #37-2-5384) are now listed as destroyed in AHIMS in accordance with impact permits 2086 and 4089.

#### viii [HVO Mitchell Pit Development ACHA, AHIP \(CQCHM 2016\) and Salvage Report \(Arrow Heritage Solutions 2019\)](#)

In 2016 (CQCHM), an ACHA was prepared for the Mitchell Pit Development Area at Hunter Valley Operations mining complex, located roughly 1 kilometre south-east of the project impact area, to support an AHIP application. The main aims of the ACHA were to provide a synthesis of prior assessments conducted in 2008 (JACTO) and 2009b (MCH) including a reassessment of previously surveyed areas and recorded sites to confirm results, in addition to a survey and test excavation program of a 50 hectare area not included in previous reports.

As part of the fieldwork in 2015 aimed at revisiting a sample of previously recorded sites the reassessment found that generally, the location, form, extent, condition and contents of the sites remained the same between the 2008 and 2015 recordings. An additional 60 Aboriginal sites were recorded during the 2015 reassessment, which mainly consisted of artefact sites and PADs. A test excavation program within eight previously surveyed PAD areas was conducted. A total of 49 artefacts were recovered, with no material identified in 25 of the 41 test pits. The very low density of sub-surface artefacts and the lack of any identifiable stratigraphy suggested that little, if any, of the original depositional context remained.

On 6 December 2016, an AHIP (#C0002193) was issued to Hunter Valley Operations mining complex for the Mitchell Pit Development Area, covering approximately 414 hectares, authorising harm to 284 Aboriginal heritage sites pending the completion of certain management conditions. Of these 284 sites, all but 1 (a scarred tree) were stone artefact sites. A salvage collection and sub-surface investigation program was conducted with representatives of the Aboriginal community in 2 stages: Stage 1, completed in March/April 2017, and Stage 2, completed in June/July 2019.



The salvage program surface collection of all 283 stone artefact sites, across 747 locations, and salvage excavations conducted at 2 sites: MP-001 PAD1 (#37-2-5122) and HC-17–PAD7 (#37-2-0793). Salvage excavations included a combination of 1 square metre test pits and a 76 metres long grader scrape at HC-17–PAD7. Grader scrapes reached a depth of 15 to 20 centimetres where the deposit was consistently found to be a silty, homogenous A1 layer atop an extremely hard clay base layer (Arrow 2019). Approximately half of the grader scrape deposit sieved to recover a total of 225 artefacts (Arrow 2019).

Management of culturally modified tree HVO-930 (#37-2-5269) was permitted by the AHIP, which included the removal and relocation of the scarred portion, were not conducted as part of the 2019 salvage scope. In 2021, the culturally modified tree was reinspected by Glen Morris (formerly NPWS) and representatives of the CHWG, and it was concluded that the scar was likely non-cultural in origin and that it should not be salvaged (Arrow 2021). It was further recommended that the site's AHIMS registration be updated, and the site is now listed as 'not a site'.

## ix Energy Australia Substation Relocation: Indigenous Archaeology Assessment (MCH 2010)

In 2010, MCH conducted a comprehensive archaeological assessment of an area proposed for relocation of an Energy Australia electricity sub-station at the Hunter Valley Coal Preparation Plant (HVCPP) adjacent to the Hunter Valley Operations mining complex Belt Road, and roughly 4 kilometres north of the project impact area. The assessment was conducted in partnership with the CHWG, which included participation in survey and a consultation meeting to discuss the results, significance, and recommendations for each site (MCH 2010).

The 21-hectare study area comprises a northeast facing slope which had been entirely cleared of native vegetation. Disturbance was present throughout the entire area through pastoral grazing, with additional impacts to the immediate east through mining, construction of the mining conveyor belt running north–south through the western portion of the study area, as well as tracks, fences and power lines (MCH 2010). The area had been assessed previously by Brayshaw and Haglund (1978) as part of the Hunter Valley No 1 Mine EIS. No Aboriginal sites were identified by the assessment.

The entire study area was subject to pedestrian survey; however, very low visibility at the time of the MCH survey resulted in poor effective survey coverage. Seven Aboriginal sites (HVO-1126 to HVO-1132) were recorded during survey, limited to isolated finds or low-density artefact scatters containing no more than 7 artefacts (MCH 2010). Artefact types included flakes and flaked pieces, with 2 artefacts displaying possible retouch. The majority of artefacts were mudstone, with single instances of chert, silcrete and tuff. All but one site, which was identified on skeletal soils of a slope exposure, were located on vehicle track exposures between 300 to 500 metres west of Farrells Creek and within 80 to 300 metres of minor drainage lines. All sites were assessed as being of very poor integrity with limited to no potential for in situ cultural materials. No areas of PAD were identified within the study area.

The assessment concluded the very low-density archaeological material shows that the study area was transitorily utilised as opposed to a focus of occupation activity. The proposed construction disturbance area did not conflict with any of the recorded Aboriginal sites, and proposed powerlines were aligned to avoid impact. All 7 sites were fenced, and sign posted for their protection. All sites identified by the assessment, HVO-1126 to HVO-1132 (#37-2-5054 to #37-2-5060), remain listed as valid in AHIMS.

#### x [Extension of Mining Operations at Ravensworth Mine \(ERM 1997\)](#)

In 1997, Environmental Resource Management (ERM) prepared an EIS for the proposed extension of mining operations at Ravensworth Mine. The EIS included detailed archaeological investigations of the Ravensworth West site, approximately 5.5 kilometres northeast of the project impact area. Archaeological survey inspected a sample of each of the 3 topographic features within the study area, including ridges/hill tops, hill slopes gullies and creek lines. A total of 58 sites were recorded during the field investigations, comprising a total of 1737 artefacts. Of the 58 sites recorded, 47 were open artefacts scatters, 1 of which was associated with possible grinding grooves. The remainder of the sites were isolated finds. Artefacts recorded included knapping debris such as stone tools, cores, flakes and flaked pieces.

The distribution of archaeological sites found during the field survey was consistent with the general pattern of sites in the general region. Archaeological sites were distributed throughout the study area, with main concentrations along the creek lines and their tributaries. Artefact densities were greater in sites associated with watercourses, probably as a result of the high degree of surface visibility in these areas due to surface erosion, as well as a "real" site distribution pattern. Site detectability was limited in other areas by the degree of vegetation and ground cover. However, the identification of sites in all landform contexts indicates their presence over the entire landscape and it is suggested that their relative density and type would be consistent across each of the landform features.

Subsurface investigations were not considered warranted for the following reasons: the shallowness of the A1 soil horizon limited the potential for subsurface deposits, the nature and distribution of archaeological material across the site was considered to be consistent with what was found during the survey, there were no rare sites found in the study area and all sites were artefact scatters which are well represented in the region. A total of 12 sites identified by this assessment remain valid in the AHIMS database.

#### xi [Cultural Heritage Investigations Hunter Valley Operations mining complex Over Land – Conveyor Firebreak, Hunter Valley \(Scarp 2011\)](#)

In 2011, Scarp was engaged to conduct a comprehensive archaeological assessment of a 27.5-hectare area prior to the establishment of a firebreak, immediately to the east of the Hunter Valley Operations mining complex over land conveyor (OLC), between Lemington Road and the New England Highway. The assessment was conducted in partnership with the Cultural Heritage Working Group (CHWG), including participation in survey and consultation meetings to discuss the results, significance and recommendations for each site (Scarp 2011). The study area featured a high level of disturbance associated with mining infrastructure, including installation of the OLC, transmission lines, a decommissioned underground mine air vent structure, as well as extensive vegetation clearance, topsoil removal, erosion, vehicle tracks, dams and culverts.

Seven Aboriginal sites were identified during survey (HVO-1133 to HVO-1139). All sites were identified as isolated finds (although 1 site contained 2 artefacts). All sites were recorded in areas of prior disturbance (i.e. unsealed access tracks and adjacent to the OLC), located along slopes and low hilltops. The assessment acknowledged the potential for further artefacts to occur in areas where ground surface visibility was poor, however they would be in very low concentration/isolation. All sites identified by the assessment, HVO-1133 to HVO-1139 (#37-2-5061 to 65 and #37-2-5315 to 16), remain listed as valid in AHIMS.

#### xii [Carrington Mine EIS Archaeological Assessment \(ERM 1999a\)](#)

In 1999, ERM completed an archaeological assessment as part of the Carrington Mine EIS, located in the vicinity of Carrington Mine's southernmost boundary approximately 8 kilometres west of the project impact area. The study area, covering 354 hectares, was described as being comprised of level to gently undulating ground, steep slopes, and low ridge country with an infilled river channel with older, potential Pleistocene age sediments expected to underlie more recent deposits (ERM 1999a).

Survey focussed on areas of proposed mining disturbance, with close examination of exposures around creeks, watercourses and dams. Clear, sparsely vegetated, and disturbed areas were identified from the aerial photograph and targeted surveyed completed on foot, whilst open areas were generally surveyed from a vehicle, with approximately 32 hectares or 10% of the total survey area having adequate exposure to detect sites due to poor ground surface visibility.

A total of 46 sites were recorded, CM1 to CM46, identified across the full range of landforms present. Site types included: open camp sites (74%, n = 34), isolated finds (22%, n = 10), 1 open camp site/scarred tree and 1 open camp site/possible scarred tree. The number of artefacts observed at open camp sites generally ranged 2 to 200 artefacts, including dense concentrations and broad scatters of isolates. Two significant sites (CM2 and CM36) were identified with high artefact densities, with the latter estimated to contained roughly 90,000 stone artefacts.

Artefacts included formal tool types, including microliths, as well as cores and flakes. Silcrete was the most prevalent raw materials, followed by mudstone, with smaller proportions of chert, quartz, quartzite, petrified wood and basalt (ERM 1999a). Sites with very high artefact numbers generally had greater percentages of silcrete artefacts, while sites with smaller numbers of artefacts, including isolated finds, were more likely to contain mudstone.

The assessment noted conservation as the ideal outcome for significant sites CM2, CM4 (scar tree) and CM36. Though conservation was considered, the final recommendations of the report included further cataloguing of surface artefacts at sites CM2 and CM36 and an analysis of the scarred tree at site CM4 tree in its present condition, prior to consents to destroy being sought for all sites within the area to be disturbed by the mine (ERM 1999a).

### xiii Carrington Mine EIS Supplementary Archaeological Information (ERM 1999b; HEH 1999, 2000)

ERM (1999b) prepared a supplementary archaeological study to provide further information on the artefacts of identified sites to better assess the archaeological significance of the Carrington locality. Of particular interest were significant raw material sites CM2 and CM36, as well as the alluvial and colluvial deposits of the study area.

The supplementary assessment found (ERM 1999b):

- CM36 was a silcrete quarry which was frequented for supply; however, only minimal knapping activities occurred there. One additional raw material source, CM47, not previously identified was recorded by the supplementary study.
- It is possible that the flats may contain some subsurface material; however, the likelihood of finding such material was extremely low. The environment is flat and featureless, and no indication of subsurface material was found.
- CM2 was a significant silcrete source and tool-making area, whilst CM39, located on the same ridge, was a large artefact production site. CM2 and CM39 were assessed as having little further in situ research value due to their erosional nature making subsoil artefacts unlikely. However, colluvial deposits below the main ridge at CM2 were identified as potentially Pleistocene age and warranting further investigation.

Subsequent investigations were carried out, including geomorphological and archaeological investigations in subsequent years (HEH 1999, HEH 2000). Geomorphological fieldwork included the excavation of 13 backhoe pits and 29 boreholes in areas surrounding significant sites and testing landforms. During the initial backhoe pits, a colluvial deposit of presumed Pleistocene age immediately below CM2 on the foot slope of the low ridge was identified and chosen for further archaeological investigation.

Archaeological fieldwork involved the excavation of a 4 square metre area. These excavations identified a new site designated Carrington Mine Colluvial Deposit Area 1 (CM-CD1; #37-2-1877). The site featured seven stratigraphic units, which extended ~1.5 metres below the surface. The deposits were heavily indurated and most of the excavations occurred using a mechanical excavator. A total of 72 artefacts were recovered from excavations, with 65 artefacts originating from the oldest stratigraphic layer (unit 5). A sample of charcoal from the lower half of Unit 3 was submitted for radiocarbon dating. The measured radiocarbon age was 930 +/- 40 years (Beta-137093). No dateable material such as charcoal was recovered from unit 5 and, therefore, the age of the artefacts is not known. However, its relatively high degree of weathering indicates it is likely to be at least early Holocene in age, and more probably late Pleistocene (HEH 2000).

#### xiv Carrington West Extension Study Area: Indigenous Archaeology Assessment (MCH 2009a)

Whilst archaeological surveys had been conducted in parts of the area previously (ERM 2005; ERM 1999b), MCH were engaged to prepare a comprehensive archaeological assessment for the proposed Carrington West Extension. The study area covered approximately 120 hectares and comprised primarily of Hunter River flats and flood plains located approximately 8 kilometres west of the project impact area.

Five isolated finds were identified as a result of the survey (HVO-1121 to HVO-1125). Four sites were identified on slopes overlooking the Hunter River flood plain area and 1 in a creek bed within 50 metres of the Hunter River. All sites were identified in disturbed contexts such as a dam wall, vehicle tracks, eroded creek bed and, therefore, the assessment found limited to no potential for in situ cultural deposits (MCH 2009a). Collection of artefacts from the 5 sites under an approved AHIP was recommended should disturbance be unavoidable. All 5 sites remain valid in AHIMS (#37-2-2754 to #37-2-2758).

#### xv Substation Access Road ACHA (ERM 2004)

In 2004, ERM were engaged by Coal and Allied to complete a cultural heritage assessment of a proposed light vehicle access road to the Energy Australia substation located south of the Carrington Pit, and roughly 700 metres west of the project impact area.

The study area for the assessment included a 900-metre long by 10-metre wide corridor extending from Old Lemington Road across cleared paddocks, transecting a minor unnamed creek line, and then up a steep slope to the top of a low ridge where the substation is located (ERM 2004). The substation access road intersects the project impact area where Old Lemington Road intersects with the tributary of the Hunter River. Survey was conducted with Aboriginal representatives on 26 October 2004; however, effective survey coverage was estimated at less than 5% (ERM 2004a).

The survey identified two Aboriginal sites, C1 Carrington (#37-2-2078) and C2 Carrington (#37-2-2079), as well as a small area of PAD associated with the unnamed creek. C1 was an isolated mudstone flake, and C2 was a scatter of eight mudstone artefacts including seven flakes and one core. Both sites were identified in exposures associated with an unformed vehicle track in a cleared paddock approximately 100 metres and 140 metres, respectively, upslope of the unnamed creek (ERM 2004). Due to the very low visibility at the time of survey, the potential for further artefacts to be present is noted, and, therefore, C1, C2 and the small area of PAD were characterised as expressions of a single low-density site across the ridge line which have been subject to natural erosional processes.

The assessment recommended no further archaeological investigation was required, with recommendations for Aboriginal community to be provided the opportunity to collect known surface artefacts as well as any artefacts found during excavation associated with construction (ERM 2004).

C1 Carrington (#37-2-2078) and C2 Carrington (#37-2-2079) are now listed as destroyed in AHIMS in accordance with impact permits 2547 and 2863.

In 2006, HLA-Envirosciences conducted a cultural assessment survey within the Hunter Valley Operations mining complex South area, located approximately 1 kilometre south of the project impact area. A total of 110 sites were identified including 12 artefact scatters, 97 isolated finds and one potential scarred tree. The sites were located on a variety of landforms but were predominantly concentrated on low slopes and alluvial flats that surrounded a seasonal creek (Wollombi Brook). Apart from 5 sites (Sites 80 to 83, and 110) the remainder were all located between Hunter Valley Operations mining complex Areas 2 and 4. The survey covered approximately 7 kilometres x 100 metres to varying levels of efficacy due to a combination of visibility and exposure constraints (HLA 2006).

The sites contained a total of 678 stone artefacts including flakes, flaked pieces, broken flakes and cores. A small percentage (n=17, 3%) of the recorded artefacts were backed or retouched. Raw material types were dominated by chert (n=423, 62%) and silcrete (n=220, 32%), but also included mudstone (n=13, 2%), petrified wood (n=19, 3%), chalcedony (n=1, 0.3%) and siltstone (n=2, 0.7%). With the exception of a potential scarred tree (Site 44), all sites were considered to be isolated finds or artefact scatters, ranging from 1 to <100 artefacts (Site 98). The latter was interpreted as significant due to the presence of many terminal stage artefacts derived from cobble outcrops.

Of significance, sites 51 and 52 showed evidence of a potential knapping floor. This was interpreted as a highly important part of the research area due to access to a reliable water source. Additionally, 7 sites were highlighted with the potential for subsurface material (sites 26 to 30 and sites 51 and 52). Excluding these sites, all other areas featured evidence of ground disturbance including erosion, deflation and truncation following extensive historic farming activities. Therefore, the sites located in Extension Area/Riverview South West, South Lemington Pit 1 and the Railway Easement were interpreted as less significant.

xvii      HVO South Riverview Salvage (MCH 2009b)

In 2009, an archaeological salvage under AHIP #1102084 was undertaken in the Hunter Valley Operations mining complex area. A total of 24 sites were revisited during the survey including 13 artefact scatters and 12 isolated artefacts. This total does not include the additional isolated artefact (site A) that was identified and salvaged (MCH 2009b).

Of the 24 sites, four were inaccessible due to being inundated by dam water (#37-5-0542, #37-5-0543, #37-5-0544 and #37-5-0545) and were not salvaged. Despite this, minor changes to site intactness were observed overall, with disturbances including erosion and visibility issues relating to water runoff and drought. This resulted in additional artefacts being collected as well as previously described artefacts being moved and or buried by deposits at 3 sites (#37-5-0536, #37-5-0537 and #37-5-0540).

Artefact densities were described as low, with 66 artefacts salvaged in total. This included flakes, retouched flakes and cores (single and multi-platform). These artefacts were made from a variety of raw material types including mudstone (n=52, 79%), silcrete (n=12, 18%), basalt (n=1, 1.5%), and an unknown material type (n=1, 1.5%). Of the 24 previously recorded sites, 11 were described to have collected most of, or all the previously documented artefacts. Upon collection from each site, all heritage associated signage and barricades were removed. After analysis, all salvaged cultural materials were relocated to the temporary cultural heritage storage facility at Hunter Valley Operations mining complex O.

xviii      [Aboriginal Archaeological Assessment of a Proposed Extension to the South Lemington Coal Mine Lease \(Kuskie 1999\)](#)

In 1999, an archaeological assessment of a 38-hectare area for a proposed lease extension adjacent to South Lemington Pit 2 was undertaken (Kuskie 1999). The study area was subdivided into 11 archaeological survey areas, which exhibited different environmental contexts including ridge crests, simple slopes, and drainage depressions. Surface visibility was low on average across the surveyed terrain, and very low in the remainder of the study area that was not subject to direct inspection.

The survey identified six artefact scatters with a total of 23 artefacts. The artefacts (mostly flakes) were predominantly made of silcrete. All sites have been affected to some extent by human and natural post-depositional processes, with the level of impacts generally moderate to high. Therefore, whilst deposits of artefacts were predicted to occur in sub-surface contexts, these were likely to be very shallow and of low integrity due to the extent of ground disturbance. Two sites identified by this assessment, artefact scatter PK3 (#37-6-0876) and isolated find PK1 (#37-6-0877) remain valid in the AHIMS database.

xix      [United Wambo project: Aboriginal Archaeological Values Assessment \(OzArk 2016\)](#)

In 2015, OzArk conducted surveys, test excavations and an auger testing program to record the archaeological values and provide management recommendations for the proposed expansion of the United Wambo project, located roughly 2 kilometres west of the project impact area (OzArk 2016). In total, this assessment evaluated 128 sites. This included 79 sites identified and recorded during the survey and 49 evaluated from an AHIMS search. The newly recorded sites included 25 artefact scatters, 34 isolated finds and 20 extensions of previously recorded sites (all artefact scatters). Nine of these previously recorded sites have been absorbed into the larger site area. Overall, the report noted that the identification of stone artefacts, that were largely but not exclusively found around watercourses and predominantly within disturbed contexts was broadly consistent with the regional archaeological context of the Hunter Valley region.

The test excavation results were sparse, with a total of 153 (0.5 metre x 0.5 metre) excavation squares opened at 6 separate localities with a total of 192 recovered artefacts, which is statistically low for the region. Additionally, 63 auger probes were excavated to verify soil depth, archaeological potential and to examine landforms. As a result of the survey and test excavations, the majority of sites (n=122, 95%) have been accessed to be of low scientific significance sighting a variety of contributing factors, including erosion, visibility and other disturbances.

xx      [Warkworth Continuation: Aboriginal Cultural Heritage Study \(CQCHM 2014\)](#)

In 2014, CQCHM completed an ACHA for the Warkworth Continuation and Mount Thorley Operations (CQCHM 2014). The extension footprint for the Warkworth Continuation encompassed 698 hectares west of the pre-existing Warkworth Mine project impact area, within the vicinity of Wallaby Scrub Road located within the Hunter Valley region approximately 13 kilometres southwest of Singleton. The extension footprint for the Warkworth Continuation is located ~10 kilometres west of the project impact area.

The desktop assessment identified 2641 previously documented sites, which consisted largely of stone artefact sites (95%), culturally modified trees, grinding grooves, a quarry, and sites of ceremonial significance (CQCHM 2014). Artefacts were mostly made of silcrete, mudstone, tuff, quartz, chert, prettified wood, chalcedony, porcellanite, and volcanic based materials. Occupation areas were identified (in varying degrees of primary or secondary contexts) within the creek valley floors of the Central Lowlands, in accordance with 'sequential positioning of foraging radii', with resource gathering activities archaeologically identified in upper slopes, and ridgelines. These occupation areas were identified along Langford Creek (located 500 metres west of the project impact area), Sandy Hollow Creek (traversing the project impact area between the Golden Highway and the Hunter River) and Doctors Creek (roughly ~2 kilometres southeast within the project impact area adjacent to the corner of the Golden Highway and Putty Road).



The desktop additionally verified that the Bulga bora grounds (#37-6-0056 and #37-6-0055), within the vicinity of the Wollombi Brook and within the western portions of the Mount Thorley mining lease (see Appendix C.2). Traditional owners requested that this area, within the vicinity of the Bulga Bora grounds, not be surveyed due to its cultural significance. Other significant sites include three stone mounds (#37-6-2315), and an earth mound (#37-6-2555) that suggested potential burials (CQCHM 2014).

A total of 110 extant sites were identified within the extension footprint. These sites were considered to have no scientific significance and were not subject to any specific requirements to address issues of cultural sensitivities, consisted of stone artefact sites (n=103), culturally modified trees (n=3), potential archaeological deposits (n=3), and grinding grooves (n=1) (CQCHM 2014).

#### xxi [Bulga Optimisation project: Aboriginal Archaeological Values Assessment \(OzArk 2013\)](#)

In 2013, Umwelt engaged OzArk to undertake an archaeological assessment for the Bulga Coal Complex (OzArk 2013a). This proposed continuation, which totalled an area of 4873 hectares, would extend works to 2035. The Bulga Coal Complex study area is located ~12 kilometres southwest of Singleton, 1 kilometre east of Bulga, and ~1 kilometre north of Broke. The project impact area is located 1-kilometre adjacent east of the BCC.

The desktop findings verified that 40% of the Bulga Coal Complex project impact area no longer included natural landforms due to mining activities. The topography featured a slope from east to west, forming the catchment area for the Hunter River and the Wollombi Brook. Several significant ridgelines were recorded within the catchment area, the most significant of these was identified adjacent to Broke Road between Putty Road and the Golden Highway.

An AHIMS search identified 266 sites in the study area. However, OzArk confirmed with the Bulga Coal Complex internal database that 228 sites were present. Of these, 224 sites were stone artefact sites, with one culturally modified tree (#37-6-0428), 2 grinding grooves (#37-6-0148 and #37-6-0967), and 1 hearth (#37-6-0505) (OzArk 2013a). A predictive model indicated that artefact scatters would likely be located adjacent to drainage features, along ridgelines, and on elevated ground overlooking watercourses.

The survey identified a total of 42 newly recorded sites consisting of mainly of stone artefact sites located within 200 metres of watercourses, with the exception of a culturally modified tree (#37-6-0428). Test excavation was undertaken to the northeast of multiple drainage areas identified for potential during geotechnical investigations. A total of 196 test pits were excavated resulting in the recovery of 235 artefacts (OzArk 2013a).

Three areas have been allocated as having high scientific significance 'BOP SC-8 with PAD', 'BOP SC-9 with PAD', and 'BOP SC-9 with PAD' as the latter contains the pre-mentioned grinding groove. All other sites have been categorised as having a moderate to low significance. Mitigation strategies included the avoidance or salvage of the sites.

#### xxii [Singleton Military Area - Indigenous Heritage Assessment \(Umwelt 2023c\)](#)

In 2023, Umwelt completed an Indigenous heritage assessment as part of a heritage management plan (HMP) on behalf of the Department of Defence for the Singleton Military Area. The Singleton Military Area is located 3 kilometres south of Singleton, between the suburbs of Pokolbin, Broke, and Whittingham (Umwelt 2023c). The project impact area is located within the southwest corner of the Singleton Military Area.

The desktop assessment identified flood plains, river terraces, and rolling hills landforms throughout much of the northern portions of the Singleton Military Area. The southern borders of the Singleton Military Area was predominantly made up rugged, rising steep terrain with elevations between 482 to 549 metres Australian Height Datum (AHD). Archaeological sites identified within these elevations include artefact scatters, grinding grooves, rock shelters, and arts sites.

The survey was subdivided into priority, with the Priority 1 areas being categorised by archaeologically sensitive landforms such as drainage lines, elevated areas, crests, and ridges. The Priority 2 areas were categorised by area's exhibiting slopes, rock outcrops, flat-land and foothills with remanent vegetation. The Priority 3 areas included modified landforms, and Priority 4 included modified landforms that have been disturbed and, therefore, were not subject to visual inspections.

There were 155 sites identified within the study area, with three new sites recorded. Within the vicinity of the project impact area (Sectors 4, 8, and 'Vere') a number of sites and occupation areas were located including the moderate to highly significant site complexes 'Nine Mile Creek Scatter', the 'Vere Shelter and Scatter', the 'Sector 8 Scatter', and site 'SMA21-GG-1' (Umwelt 2023c). Stone material types largely consisted of mudstone and silcrete, with higher densities having been located on elevated banks in proximity to watercourses. Artefact scatters identified across the Singleton Military Area include PADs, and it was suggested that excavation of these sites may provide evidence for multiple occupation periods (e.g. Mudies Creek PAD #37-6-3966 and Mudies creek/Emigrant Creek site complex).

#### xxiii [Glendell Continued Operations project: Aboriginal Archaeology Impact Assessment \(OzArk 2019\)](#)

In 2019, OzArk was engaged by Umwelt to complete an Aboriginal archaeology impact assessment (AAIA) for the proposed Glendell Continued Operations project. This work sought to extend operations at the Glendell Mine to 2024 (OzArk 2019). The project impact area is located roughly 10 kilometres southwest of the Glendell Mine boundary.

The desktop assessment confirmed that approximately 414 hectares (55%,) of the disturbance area included flats and floodplains which intersected a number of major tributaries (e.g. Bowmans, Yorks and Swamp Creeks). Slopes were identified within 229 hectares (40%) of the proposed disturbance area with stratigraphy generally classified as shallow due to historical modification of the landscape. Ridges were located within 5%, of the landscape and include two prominent ridgelines located in the north-west and centre of the project impact area. An AHIMS search verified 302 sites within the disturbance area, 96% of which are stone artefact sites. In addition to this, significant sites include an artefact scatter with quarry, a conflict site, an art engraving site, and a restricted site (OzArk 2019).

During the survey 124 sites were recorded, of these, 55 were previously identified and 71 were newly recorded. Following this, test excavations were undertaken in 12 locations in areas identified with PADs during survey. Test excavation resulted in the recovery of 180 artefacts within 101 of the excavated pits, with the highest densities consisting of 17 artefacts.

Almost all newly identified sites were categorised as having low significance, this was predominantly due to their secondary context, low density levels, and their homogeneity with artefacts within the larger region (OzArk 2019). Three sites in total were given a moderate level of significance, including a culturally modified tree (#37-3-1561), and two artefact scatters (#37-3-1574 and #37-3-1571). Previously identified sites of moderate significance include the artefact scatter 'Bowmans/Swamp Creek Trench 1' (#37-3-0469). Mitigation strategies involved the avoidance of sites through project re-design and archaeological salvage (OzArk 2019).

### E.2.2 [HTP Central](#)

#### i [Problems of the Lower Hunter and contacts with the Hawkesbury Valley \(Moore 1981\)](#)

Plans in the early 1970s to conduct research of what is HTP Central were initially disbanded due to the widespread destruction of the landscape from 1802 onwards by colonialists (Moore 1981). This included stripping timber throughout the lower Hunter for coal mining, agriculture and procuring pastoral land with the destruction of sites escalated during periods of intense flooding as they were no longer protected by the forest. Despite this, surveys were undertaken throughout the Wollombi Valley, Mogo Creek and the lower Macdonald Valley.



Results of a survey in 1969 indicated that the area was rich in art and rockshelter sites; however, many of the sites had been subject to vandalism. Two sites were selected for test excavation due to their intact preservation. These included a painted shelter high in the hill on Stockyard Creek (Wollombi) and a large overhang without paintings located on a creek near Mount Yango Road. The excavations were undertaken in 1970 in both rockshelters which are located between 10 and 13 kilometres west of the project impact area. Results from Stockyard Creek (BL/1) recovered 2725 artefacts from the test excavation with tools including backed blades (n=96), scrapers (n=51), points (n=68) and flakes (n=2). The Mount Yango Road rockshelter (YC/1) excavation resulted in a total of 3801 total artefacts which included 282 stone tools.

Radiocarbon dating from Square A at Mount Yengo (one of two excavated pits) at both sites showed that the occupation phases were consistent with previous research in the upper Hunter Valley dated to around 2000 BP (Moore 1970).

Between 1972 and 1977, an additional rockshelter (MR/1) with faded red ochre paintings was excavated on the southern side of Macdonald Creek which produced a radiocarbon date (on charcoal from 1.3 metres below the surface) from at least 5800 BP. A total of 4945 artefacts were recovered from five separate test pits along the cross section of the rockshelter as well as about 20 grams of shell along with fragmented mammal, bird and fish bones. The artefacts across all the sites were mostly made of chert, quartzite/silcrete and igneous materials. An analysis of the source of stone materials within this research concluded that there was a divide in raw material procurement between inhabitants of the Hunter Valley, especially within heavily forested areas, and the coastal regions.

## ii [Mount Yengo Excavation Report \(McDonald 1994\)](#)

Between 1987 and 1988, excavations were undertaken in 2 rock shelters a couple of kilometres from the base of Mount Yengo, located approximately 20 kilometres west of the project impact area (McDonald 1994). The sites, Yengo 1 (NPWS #37-5-1) and Yengo 2 (NPWS #37-5-1), are situated 10 metres apart with one (Yengo 1) showing extensive evidence of occupation in the form of multiple art panels on the walls and roof, while the other (Yengo 2) has sparse archaeological remnants.

The excavation results from Yengo 1 showed radiocarbon dates from the floor deposit to at least 6000 BP with occupation ceasing late in the last millennium (McDonald 1993). Similarly, the mainly stencilled art panels (n=472) were dated by association to the initial occupation of the site between 5000 to 6000 BP, with the peak period of occupation estimated to be between 2000 to 1500 BP when backed blades were manufactured at the site. Over 1500 artefacts were recovered during excavations with implements with retouch (n=73) prevalent from Layers III and IV. Along the outer edge of Yengo 1, 55 grinding grooves were also recorded with various degrees of grinding/pitting.

Yengo 2 in comparison had a reduced number of art motifs (n=107) of mostly hands and other shaped variations. While 11 test pits were excavated resulting in around 2.2 tonnes of deposit from 123 spits, it was discovered that large scale rat (*Rattus rattus*) burrows were prevalent throughout the site. Only 6 artefacts were recovered during wet sieving and no faunal/seed remains were observed. Based on a comparative analysis of other art sites in the region, it was determined that the art style of Yengo 1 was typical of Wonnarua style, while Yengo 2 showed more Darkinjung influences.

## iii [Dreamtime superhighway: An analysis of Sydney Basin rock art and prehistoric information exchange \(McDonald 2008\)](#)

This text documents Holocene aged (>5000 years old) rock art recordings and rockshelter excavations completed between the early 1980s and 1994 throughout the Sydney Basin (encompassing the southern and central portions of the project impact area). The accumulation of a broad dataset allowed for models to be developed between how different rock art components (e.g. pigment versus engraved art) may have functioned across the region, with a regional model in Information Exchange Theory ultimately proposed by the research.

The sample size for this analysis included 717 engraved sites (including 7804 motifs) and 546 rockshelter art sites (including 14,424 motifs), which represented 39.5% and 32.7% respectively of the known sites in the region at the time of publication. In terms of engraved sites, the synthesis of data found that the topographic location was more diverse than previous work had suggested with almost half of the engraving sites found on ridgelines. The predominant motif in this region were human foot/track (*mundoe*), followed by fish, macropods, men and bird tracks. The rockshelter art sites contained on average 26 motifs per site, with most sites containing <10 motifs.

Topographically, the location of the art sites were concentrated on hillslopes, with fewer occurrences on ridgelines and valley floors. The predominant motif recorded in the region was the hand stencil followed by macropods and anthropomorphs. The pigment art was generally recorded in poor states of preservation.

Key findings of this study include (McDonald 2008: 341):

1. the 2 art bodies represent different manifestations of the same art tradition – although they demonstrate inherently distinctive traits due to their different repertoires of technical options
2. shelter assemblages are generally larger than open engraving assemblages
3. there are striking similarities in the motif preferences demonstrated by the two components with several major differences (e.g. marine depictions dominate the engraving assemblage, but these themes are relatively absent from the shelter art assemblage)
4. stylistic clines and boundaries are demonstrated by both art components, and there is considerable congruence in the location of these
5. shelter art sites are present in great numbers across the entire Hawkesbury Sandstone landscape, while the distribution of engraving sites is more restricted. There is a dense core of engraving sites in the central coastal area of the Basin. Engraving sites decline in frequency towards the northwest, although assemblage sizes in this area are very large. To the south of the Basin, particularly south of the Georges River, the number and size of engraving sites diminish.

Overall, the model proposed by this research suggested that through the style of art, non-verbal communication was used to document identity in the past (e.g. Wiessner 1990). Additionally, through stylistic behaviour, groups across the region who were not in constant verbal contact with each other, were able to communicate important social messages and demonstrate both broad scale group cohesion and within group distinctiveness (McDonald 2008: 340).

#### iv [Corrabare North Cultural Survey Report \(Heritage Now 2023\)](#)

In 2023, Heritage Now was engaged by NPWS to complete a cultural survey of the Corrabare North Flora Reserve (encompassing the project impact area). A total of 12 Aboriginal heritage sites had been previously recorded in the Corrabare North Flora Reserve. Four of these sites were relocated as part of the survey with an additional rockshelter with PAD site recorded (#37-6-4258, 1.5 kilometres west of the project impact area). Of the 4 relocated sites, 2 (#37-6-3780 and #37-6-0727) are within 600 metres of the project impact area.

Site #37-6-0727 (rockshelter with PAD) is a small shelter measuring 4.1 metres wide, 2.1 metres high and 2.3 metres deep. The rockshelter was first identified in 1994 but was recorded in poor condition with heavy erosion and visible cracks in the sandstone. Site #37-6-3780 (rockshelter with art) is a large rockshelter measuring 22 metres wide, 3.1 metres high and 9 metres deep with >20 centimetres of intact soil deposit. The shelter includes five white hand stencils on the western side of the cave that appear to have been completed by the same artist. The rockshelter was first recorded in 2016 and remains in good condition.

Discussion at the time of re-recording focussed on understanding the cultural landscape as a whole, rather than individual sites. As noted by the RAPs at the time, #37-6-3780 in particular seems to point toward significant locations in Awabakal Country. Grouped with other rockshelters that were previously identified in the Flora Reserve, both of these sites were determined to be of moderate to high significance in terms of aesthetic, historic and scientific values.

#### v [Minmi Corridors Assessment \(Umwelt 2003\)](#)

In 2003, Umwelt was engaged by the Newcastle City Council to clarify the natural and cultural values of the western part of the Newcastle Local Aboriginal Land Council (LALC) area extending west to Mount Sugarloaf in Cessnock City Council and south into Lake Macquairie City Council, named the Minmi Corridors project. The landscape was assessed on a regional scale in collaboration with various community and government stakeholders with the goal to identify areas of ecological and cultural significance.

The project found that large portions of the study area had ecological, landscape historic and Aboriginal cultural heritage values that were recognised at national, state and local level. In particular, a principal core conservation corridor with multiple ecological, scenic and cultural heritage values (including Aboriginal pathways, ceremonial and archaeological sites) was identified extending from the crest of the Sugarloaf Range to link with the Hexham Swamp Nature Reserve area. The report concluded that the Newcastle City Council would need to consult further with Cessnock City Council, the land owners and other stakeholders (including the Awabakal people) before any decision on future management was made.

In terms of archaeological potential, 4 soil landscapes/regions were identified as having high local and regional significance in collaboration with the Awabakal people. These included Sugarloaf (30 kilometres east of the project impact area), Hexham Swamp, Bobs Farm as well as Rivermead, Wyong and Hamilton. These landscapes housed high numbers of archaeological sites in excellent condition and provided rare opportunities to examine complex archaeological evidence showing the way Aboriginal people used and occupied changing environments during the Holocene. A further 2 areas, including Stockrington and Killingworth were recorded with high level local significance with moderate regional significance due to the wide variety of archaeological sites within the landscape but exhibited varying levels of disturbance.

### E.2.3 [HTP South](#)

#### i [Aboriginal Flakes and Tools of Newcastle and District \(Cooksey 1926\)](#)

This paper was written following the development of Newcastle where, at the time, the large-scale growth resulted in the complete or partial destruction of many Aboriginal sites (Cooksey 1926). Although not adjacent to the project impact area, this study helps characterise some of the earliest studies of stone tool manufacture throughout the greater Hunter Valley. The paper emphasised that the focus of lithics research should shift from only documenting complete weapons to recording cruder, broken implements that represented the everyday lives of past people. The author draws on a number of sources from the early 20th century for the literature review and largely focuses on 23 sites central to Newcastle.

Within these sites, the lithics were categorised into 6 main classifications including unworked stones as tools, flakes and rough tools made with a minimum of labour, highly finished but unground implements, axes with ground edges, miniature flakes without secondary chipping, and miniature flakes with secondary chipping. Results showed that the most common tool types identified throughout the region were known as oystery spoons (chert flakes with at least 2 cutting edges) that were recorded in proximity to middens as well as backed knives and common scrapers.

## ii [Aboriginal Occupation in the Dudley-Jewells Swamp Area \(Dyall 1972\)](#)

This article reviews the archaeological evidence of the Jewells Swamp area, with a primary focus on the region between Freshwater Creek, Dudley-Redhead Heath, the Dudley Lagoon and the nearby coastline within Awabakal Country (Dyall 1972). This area is located roughly 15 kilometres east of the project impact area along the eastern side of Lake Macquarie. Little prior research was referenced throughout the text, with the exception of accounts from a mission in Belmont in 1828 describing hunter-gathering activities in the area of a group of roughly 64 Aboriginal inhabitants (Threlkeld and Gunson 1974).

The paper focussed on the classification of site types, settlement patterns and archaeological evidence such as raw material procurement for stone tool manufacture and evidence of past subsistence patterns. The author identified that campsites in the region were likely in proximity to sand dunes and watercourses where many microliths and shell material had been previously recorded. Full details of these sites, including when they were collected, were lodged with the Australian Museum in Sydney.

A small section on ceremonial sites examined in 1971 discussed the importance of white quartz for young men of the Worimi tribe around Port Stephens (Awabakal). A large piece (fist sized) of quartz was believed to have been brought in from Morna Point or Kulnuru that were located 48 kilometres away from the site. Previous ethnographic observations had noted that young men who had been initiated at the Keepara ceremony carried a piece of crystal in a small bag with them.

## iii [Newstan Colliery Life Extension project EIS \(Umwelt 1998\)](#)

In 1998, Umwelt completed an EIS for the extension of the Newstan Colliery located 25 kilometres northeast of the project impact area (Umwelt 1998). The extension proposed to open an additional 15.16 square kilometres of underground mining area with an estimated 59 million tonnes of mineable coal reserves expected to be extracted.

The Aboriginal archaeology section outlined that 10 potential sites including 9 rockshelters and 1 axe grinding groove site were identified within the extension area during survey. It was noted that rockshelters with deposit were relatively rare in the western hinterlands of Lake Macquarie and that the identification of these sites would allow for more robust understandings of how Aboriginal occupants used the landscape. Of the 9 rockshelters, 5 (LEA1, LEA3, LEA4, LEA7 and LEA9) were considered to have greater potential for recovering archaeological materials (e.g. artefacts and/or shells). As the proposed extension of the colliery was for underground mining, the recommendations focussed on avoiding impacts and protecting the in-situ deposits through recording and monitoring over time.

## iv [Eraring Battery Energy Storage System ACHA \(Jacobs 2021\)](#)

In 2021, Jacobs prepared an ACHA as part of an EIS for the Eraring battery energy storage System (BESS), located approximately 13 kilometres east of the project impact area (Jacobs 2021). The BESS was located in the existing power station footprint (one of Australia's largest) and planned to have an increased storage capacity of 2880 megawatts.

Through a desktop analysis of previously recorded sites the report identified that no sites had been previously identified within a 3 kilometres buffer of the BESS. Similarly, due to previous disturbance across the site, the predictive model projected that there was a low potential for grinding grooves, culturally modified trees or PADs, though it was noted that landforms associated with the freshwater tributaries of Lake Macquarie had high archaeological potential. Throughout the survey, no sites (including PADs) were identified across the BESS. As part of the management measures, an unexpected finds protocol was recommended for works to commence.

In 1995, a number of archaeological surveys were undertaken as part of an EIS study to determine the density of Aboriginal sites within the State forest surrounding Morisset. This area incorporates parts of the project impact area in the 116,000 hectares of State forest in the study region (Kinhill Engineers 1995). Prior to this investigation, there were approximately 200 Aboriginal archaeological sites, which mostly consisted of sandstone rockshelters with art or axe grinding grooves, listed in the NPWS Aboriginal Sites Register (now AHIMS) in the study region. On a broader scale (110 kilometres x 100 kilometres) incorporating more of the Morisset Forestry District, the number of recorded sites increased to 4800 with over 75% of the sites associated with sandstone rockshelters.

During the survey, 32 open artefact scatters (all with <6 artefacts in total) were recorded in the study region and mostly occurred along ridge tops or valley floors. Conclusions from the survey stated that despite a long history of disturbance throughout the region, the field investigation indicated that no impacts were made on sandstone sites such as rockshelters or grinding grooves. This contrasted to artefact sites, which were heavily impacted by past logging activities and subsequent erosion events.

Recommendations from this investigation included the protection of all sandstone sites located outside of already projected zones from logging (e.g. State forests) which included avoidance measures. Open stone artefacts sites, however, were largely identified in areas already undergoing continual impacts and were recommended to be revisited every ten years to verify their status.

### E.3 Site definitions and recording methods used for this assessment

#### E.3.1 Aboriginal sites

In the AHIMS database, Aboriginal sites are defined in several ways. At the simplest level, sites are recorded as 'closed' or 'open'. Closed sites are associated with rockshelters and include other evidence of Aboriginal occupation that may be present, such as areas where subsurface Aboriginal objects may occur within the shelter (PAD), faunal remains, and art on the shelter walls (paintings/engravings). Open sites are broadly defined and encompass all other types of Aboriginal site features that are located in areas where there is no rockshelter. The most common open site features found generally include artefacts, grinding grooves, art, culturally modified trees, and shell deposits (middens) (OEH 2012). The presence or absence of stone artefacts is often a defining factor in site identification, with almost every site likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of past Aboriginal visitation.

Any 1 site (or group of linked sites described as a 'complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different site features known to occur in the vicinity of the project impact area is provided in Table E.2 and use definitions provided by OEH/DECCW and those adopted by EMM in their field investigations to produce consistency in recording. Similarly, there may be places of contemporary significance to Aboriginal people in the region and that will require consultation with this community to identify.

**Table E.2**      **Site definitions and recording**

Site feature	Definition and recording methods
Aboriginal ceremony and Dreaming	Previously referred to as mythological sites these are spiritual/story places where no physical evidence of previous use of the place may occur (e.g. natural unmodified landscape features, ceremonial or spiritual areas, men's/women's sites, Dreaming (creation) tracks, marriage places, etc.)
Artefact site (open stone artefact site)	<p>Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people. Open stone artefact sites were defined by the presence of one (isolated find) or more (artefact scatter) stone artefacts visible on the ground surface. The boundaries of a site are limited to the spatial extent of the visible stone artefacts. The mapped site points and/or 'site areas' do not represent the areas of PAD that also apply to some sites (refer to the term PAD below).</p> <p>Open stone artefact sites were recorded by marking each artefact location or each cluster of artefacts within a 5 m radius as a separate waypoint in the global positioning system (GPS). Site boundaries were allocated by drawing a line around the cluster waypoints for each site using ArcGIS software. Stone artefacts more than 50 m apart were recorded as separate sites. EMM Consulting Pty Limited (EMM) acknowledges that the 50 m rule applied here is an arbitrary distinction for site boundaries and is used mainly for efficiencies in site management and to establish consistency in site recording methods</p>
Burials	A traditional or contemporary (post contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked (e.g. in caves, marked by stone cairns, in sand areas, along creek banks, etc.)
Fish trap	A modified area on watercourses where fish were trapped for short term storage and gathering.
Grinding grooves	Grinding grooves were defined as an area of outcropping bedrock containing evidence of one or more grinding grooves where ground stone hatchets or other grinding practices (i.e. seed grinding) were implemented.
Habitation structure	Structures constructed by Aboriginal people for short- or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds, etc.
Modified tree (carved or scarred)	<p>Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc., or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.</p> <p>Modified trees (either carved or scarred) can be difficult to identify. Scars commonly occur on trees through natural processes such as branch tears, insect damage, storm and fire damage and faunal damage. Scars can also occur from mechanical damage from vehicles or farming equipment.</p> <p>The attributes of potential scarred trees were discussed during the survey amongst archaeologists and RAPs before it was decided if a scar would be recorded or not. A precautionary approach was adopted, whereby some of the more ambiguous examples were recorded anyway. The assessment of scar trees was made from the experience of the survey team and the guideline <i>Aboriginal scarred trees in New South Wales: a field manual</i> (DEC 2005). In some of the more ambiguous examples, it cannot be verified whether some scars recorded during the survey are of natural or Aboriginal origin. In such instances, an expert evaluation by a scar tree expert (arborist or other) would be required to determine the status of certain trees.</p>



Site feature	Definition and recording methods
Potential archaeological deposit (PAD)	<p>An area where Aboriginal objects may occur below the ground surface.</p> <p>The term 'potential archaeological deposit' was first applied in Sydney regional archaeology in the 1980s and referred to rockshelters that were large enough and contained enough accumulated deposit to allow archaeologists to predict that subsurface cultural material was likely to be present. Since then the term has come to include open sites where the same prediction can be made.</p> <p>EMM has defined PADs as the predicted extent of concentrated subsurface Aboriginal objects in a particular area. PADs are not technically Aboriginal sites until, and if, subsurface Aboriginal objects are identified, which is typically established through archaeological test excavation. PAD areas have been assigned to landforms that are distinguishable from the surrounding landscape (e.g. elevated areas with good outlook overlooking watercourses) as being likely to retain higher artefact densities than the assumed 'background scatter' of archaeological material in the broader landscape.</p> <p>The identification of PADs associated with Aboriginal open camp sites was partly based on observations in the field and discussions with RAPs but also related to the predictive model. Although PAD was attributed to areas for a variety of reasons, the main qualifiers were:</p> <ul style="list-style-type: none"> <li>the presence of surface artefacts or other Aboriginal objects. Ground surface visibility as part of the archaeological survey effort was typically considered high enough in each PAD area to identify at least one or more surface artefacts thereby indicating likelihood of subsurface potential. Notwithstanding, finding no visible surface artefacts in an area would not disqualify an area from being attributed with PAD</li> <li>level to gently inclined ground (&lt;10%) indicating suitable camping or activity areas</li> <li>contours that distinguish the landforms with PAD from the surrounding landscape (e.g. spur crest, hill crest or knoll). Landform boundaries were also interpreted through observations in the field. Notably, rocky crest landforms that were protected from intensive cultivation were often attributed with PAD</li> <li>proximity to water: typically up to 100 m from 1st and 2nd order streams and up to 200 m from 3rd order streams and above. Elevated landforms at the confluence of higher order streams were also more likely to be attributed with PAD.</li> </ul> <p>EMM acknowledges that all PAD areas have been historically cleared of native vegetation and some have been subject to pasture improvements such as ploughing. As such, the term PAD does not assume high subsurface integrity; instead it is a prediction of potential subsurface artefact concentrations.</p> <p>All stone quarry sites are predicted to have PAD. The assumption is that in most cases the visible surface material at quarries is represented by larger artefacts (such as cores) and that smaller material (e.g. flakes) is likely to be buried.</p>
Restricted	Site information contained in the AHIMS is available only to certain authorised groups of people, as requested by the Aboriginal community. Detailed information may not be available in search reports.
Shell	An accumulation or deposit of shellfish from beach, estuarine, lacustrine or riverine species resulting from Aboriginal gathering or consumption. Usually found in deposits previously referred to as shell middens. Must be found in association with other objects like stone tools, fish bones, charcoal, fireplaces/hearths, and burials. Will vary greatly in size and composition.
Stone quarry	<p>Usually a source of good quality stone which is quarried and used for the production of stone tools. Stone quarries represent where Aboriginal people gathered raw stone materials for stone tools and/or manufactured stone tools from the adjacent source material. Quarry sites are found at rock outcrops where the material was of suitable quality to have been used to manufacture stone tools. Stone quarries were defined by the presence of outcropping stone material with nearby evidence of the same material type used in the stone tool manufacture process. This was most commonly indicated by large stone cores or stone flakes distributed amongst the same naturally outcropping material.</p> <p>EMM acknowledges that the 'open stone artefact' site type shares some of the same characteristics as 'stone quarries', such as the presence of stone artefacts. However, they have been distinguished from each other because quarries can not only represent open camping activities, but also a fixed location where Aboriginal people needed to visit to extract a resource. In contrast, the locations of typical open camp sites were not fixed but chosen by Aboriginal people for their favourable conditions.</p>

## E.4 An overview of the AHIMS data obtained for the project

A total of 4812 Aboriginal heritage objects, sites and places were identified via the AHIMS searches (see Table E.3, Figure 8.2, Appendices E.3, E.5, E.6 and E.7). When removing duplicate listings and sites listed as 'not a site' or 'deleted', this number was reduced to 3833 sites registered within the search area. Of these, 908 sites have been 'destroyed', with 2925 sites listed as 'partially destroyed' and/or 'valid'. The majority of the destroyed sites are located in HTP North and are a result of approved mining activities typically associated with Hunter Valley Operations mining complex and/or Bulga mine complex (see Appendix E.2). There are a multitude of discrepancies between information provided on the AHIMS site cards and the exported AHIMS data. Due to the large number of AHIMS sites within the search area, only the site cards within or near the project impact area (n=732) were checked and validated; this number is reduced (n=723) following validation.<sup>14</sup> Many of these sites were also revisited during the field survey (*Chapter 9 (Field investigations)*).

Across the entire dataset (extant and destroyed), the most common site types registered in AHIMS for the study area are artefactual sites (n=3192, ~83%)<sup>15</sup> that includes either stone artefact scatters and/or isolated finds. Many of these registered stone artefact sites do not specify the number of artefacts associated with the site (hence referenced as "undefined artefact site"). The remaining sites commonly represented include grinding grooves (n=155, ~4%) and rockshelters (n=320, ~8%), including those with art and/or engravings (n=285, ~7%). However, rarer site types including burials, ceremonial sites including Boras, stone arrangements, quarries, and 'open site' occupation zones are prevalent across the broader Hunter region, some potentially of Pleistocene age (Brayshaw 1987).

With respect to site distribution, the registered sites in the region appear to primarily be the result of cultural heritage management assessments, with some evidence of research based and/or community-initiated investigations. Within HTP North, the sites are typically registered in the vicinity of mining operations near Hunter Valley Operations mining complex and/or Bulga mining complex. This high-density clustering of sites around mining operations is more likely indicative of the level of investigation associated with planning and development proposals in this region, rather than a robust discernible archaeological patterning. Within HTP Central and HTP South, there has been limited investigations to date. Previously documented sites within the State forests appear to be a mixture of amateur bushwalkers and/or hobby groups, and opportunistic recordings by NSW State forests personnel when encountered. Where available, these sites are almost exclusively characterised as rockshelters with various amounts of art and/or deposit.

The AHIMS results align closely with the previous studies outlined in *section 8.2* and Appendix E.2. The presence of sandstone scarps and outcropping occurs primarily in and around HTP Central and HTP South and are dominated by rockshelter and grinding groove site types which require specific geological and landform conditions. These landforms are most prominent in State forests such as Pokolbin, Corrabare, Watagan and Olney and are often also associated with watercourse channels containing exposed sandstone bedrock, and steep to precipitous cliffs. In contrast, rockshelter sites are considered rarer in the central lowlands of the Hunter region (HTP North), where the topography is gentler (Dean-Jones and Mitchell 1993).

There are lesser occurrences of burials, ceremonial sites, hearths, stone arrangements and quarry sites within proximity to the project impact area. The limited presence of these sites across the region suggests a low probability of their occurrence within the project impact area. For example, burials are most commonly exposed in coastal environments or through erosional processes and/or via excavation (Brayshaw 1987). Similarly, hearths are often present in highly eroded or disturbed environments where their chance of survival is limited, particularly in HTP North.

<sup>14</sup> Due to this cleaning of only a portion of the data, there may be some inconsistencies when presenting these numbers in different ways.

<sup>15</sup> Note, numerous sites contain multiple attributes, these values therefore may capture the same site multiple times for different features.



There are 2 notable patterns that can be considered to reflect the past use of the landscape:

1. rockshelters (usually containing art) are generally found in the HTP Central and HTP South, where steep relief and sandstone outcropping – a necessity for such sites – is prevalent
2. clusters of sites along high (8th to 9th order) and moderate (2nd to 4th order) watercourses within the study area, most notably in HTP North and HTP Central along the Hunter River and its tributaries, Wollombi Brook, Parnells Creek and Saltwater Creek; and which suggests these corridors were a focus of past use. Higher densities of artefacts with typically moderate scientific significance are generally located within 100 metres of watercourses (EMM 2023; ERM 1997; JACTO 2008; Kayandel 2018). Previous archaeological investigations have identified artefact sites with upwards of 500 artefacts present in such landscapes (Jacobs 2019b). Limited archaeological investigations in HTP South have resulted in very few clusters of sites along watercoursewatercourses in this region being noted, but equally the terrain does not support wide floodplains or terraces where such sites may survive if present.

Of note is a conflict site identified as ‘Upper Hunter Valley Massacre Site’ (#37-3-0390), which was initially recorded in 1998 as ‘Ravensworth Massacre’. The site coordinates for this AHIMS site are situated ~2.3 kilometres north west of an isolated portion of the project impact area in HTP North, relating to a proposed project intersection upgrade of the New England Highway near where it crosses Foy Brook. Ethnographic accounts provide further insight into this massacre event, with a broader summary of numerous violent events occurring in throughout the 1820s provided in *section 6.6*. The site was initially recorded by the NPWS as a placeholder based only on a description in Millis (1992) and has resulted in a hypothesis that the massacre occurred *in* the village of Ravensworth. However, the specific location of the massacre event is unknown, and the event and its location is primarily based on a reference described by Millis (1992). A detailed review of primary sources relating to the massacre was undertaken by Umwelt (2004), and is summarised in a later assessment for the Ravensworth Operations Project (Umwelt 2010:5.39-5.40); and more recently by Dunn (2020). The report concluded (Umwelt 2010:5.40) that the ‘above evidence implies that the Aboriginal people that took part in the attack came from the mountains and were returning to the mountains when the reprisal attack (massacre) took place. If the Aboriginal attackers had travelled 20 miles (approximately 32 kilometres) in the direction of the mountains (or even into the mountains), the site of final conflict could not have been in the Ravensworth village area...’. As a result, in 2020, the site was updated from recommendations made by OzArk (2016) to reflect the limited information provided by NPWS regarding the site’s location and its lack of primary accounts, renamed ‘Upper Hunter Valley Massacre Site’ to reflect such uncertainties. It is also worth highlighting that Dunn (2020) in his more recent review of frontier violence in the Hunter Valley similarly suggests the site was likely some distance north of Ravensworth, and further from the project impact area than the current AHIMS listing.

The AHIMS search results also included 7 registrations for which details, including location and site type, are restricted, and which are typically burials and/or significant ceremonial sites. Heritage NSW has confirmed no intersection between these sites and the project impact area, and documentation is provided in Appendix E.6. Other burials (n=3) present within the search areas include ‘MT Auburn’ (#45-3-1855), ‘Worwallen Creek/Hay Trig’ (#45-3-0921), and ‘Dingo Shelter’ (#45-3-1207) – all are a considerable distance from the project impact area (>2 kilometres). ‘Mt Auburn’ (#45-3-1855) refers to a burial of an individual, an Aboriginal man named ‘Crow’, who worked on property owned by the Thompson family near Dairy Arm Road and was buried there in c.1826. The site card for ‘Worwallen Creek/Hay Trig’ (#45-3-0921) is incomplete, but notes the burial is somewhere in ‘very rugged country’ around the mapped location, which is located in the hills off Woody Arm Road and north of Wollombi Brook. The final site, ‘Dingo Shelter’ (#45-3-1207), is closest to the project impact area (2.2 kilometres southwest of Walkers Forest Ridge Road). This site card represents a small rockshelter with a low opening (1.25 metres), and the site name appears to be referencing a dingo den inside the shelter. Two quartz flakes were recorded, as well as some shell (3 to 4 fragments, freshwater mussel). The reference to a burial here may be in error – non-human bone is recorded, likely macropod, but no reference to human burial is made on the site card.

Other notable sites are present across the broader HTP South and HTP Central regions. Significant grindings grooves have been observed at the Abbots Falls cultural landscape (#45-3-4663, #45-3-4564, #45-3-0972, and #45-3-1934; *Chapter 9 (Field investigations)*), where several hundred of grooves have been observed on a tributary of Dora Creek. In particular, #45-3-4564 represents at least 100 grinding grooves located on sandstone platforms within and adjacent to the creek. Visibility at the time of recording was obscured by heavy leaf litter, and more grooves are likely in the vicinity.

Other significant sites include an art site 'Corrobare State Forest Western Side of Landons Rd' (#45-3-3583) and waterhole 'Corrobare State Forest Rd 2' (#45-3-3582) that are located within 100 metres of each other, <200 metres south of an unnamed 3rd order stream and within >100 metres of the project impact area in HTP South. These sites are likely associated with the recent formal assessment of Corrabare North Flora Reserve by Heritage Now Pty Limited (see *section 8.2.2*). Within HTP Central, an Aboriginal resource and gathering site, 'Congewai Creek Native Cherry ARG' (#37-6-4165) is located <100 metres from the project impact area and in proximity (<200 metres) of Congewai Creek (5th order stream). The site comprises a Native Cherry tree which is recognised as a traditional food resource utilised by Aboriginal people in the past. Further, rockshelter site 'Monkey Place Ck One Lizard SWA' (#37-6-3710) (>200 metres of the project impact area) comprises a single ochre drawing likely depicting a bird track in a relatively small rock-shelter. The location of this site and a number of other rockshelter sites in the State forests have been accurately recorded and relocated by Collette Douchkov in the last decade. All sites discussed here are confirmed as located outside of the project impact area.

**Table E.3** Previously documented AHIMS sites within the search area

Site type	Number (n)	% of total
<b>HTP North</b>		
Aboriginal ceremony and dreaming	2	0.05
Aboriginal resource and gathering	2	0.05
Aboriginal resource and gathering, Aboriginal ceremony and dreaming	7	0.18
Aboriginal resource and gathering, undefined artefact site, PAD	1	0.03
Art (pigment or engraved)	7	0.18
Art (pigment or engraved), Aboriginal ceremony and dreaming	1	0.03
Art (pigment or engraved), culturally modified tree (carved or scarred), undefined artefact site	1	0.03
Art (pigment or engraved), grinding groove	1	0.03
Burial	1	0.03
Ceremonial ring (stone or earth)	3	0.08
Ceremonial ring (stone or earth), art (pigment or engraved), grinding groove, Aboriginal ceremony and dreaming	1	0.03
Ceremonial ring (stone or earth), stone arrangement, grinding groove, water hole	1	0.03
Conflict	1	0.03
Culturally modified tree (carved or scarred)	15	0.39
Culturally modified tree (carved or scarred), undefined artefact site	6	0.16
Grinding groove	36	0.94

Site type	Number (n)	% of total
Grinding groove, Aboriginal resource and gathering, Aboriginal ceremony and dreaming, culturally modified tree (carved or scarred), undefined artefact site, PAD	1	0.03
Grinding groove, isolated find	1	0.03
Grinding groove, undefined artefact site	1	0.03
Grinding groove, water hole	3	0.08
Grinding grooves, habitation structure, isolated find	1	0.03
Grinding grooves, isolated find	1	0.03
Grinding grooves, PAD	1	0.03
Hearth, isolated find	1	0.03
Hearth, low density artefact scatter (>20)	1	0.03
Hearth, undefined artefact site, PAD	1	0.03
High density artefact scatter (>50)	64	1.67
High density artefact scatter (>50), hearth, PAD	1	0.03
High density artefact scatter (>50), PAD	15	0.39
Isolated find	625	16.31
Isolated find, PAD	51	1.33
Low density artefact scatter (<20)	419	10.93
Low density artefact scatter (<20), PAD	34	0.89
Midden	1	0.03
Moderate density artefact scatter (21–50)	79	2.06
Moderate density artefact scatter (21–50), PAD	9	0.23
PAD	14	0.37
Rockshelter, art (pigment or engraved)	78	2.03
Rockshelter, art (pigment or engraved), culturally modified tree (carved or scarred)	1	0.03
Rockshelter, art (pigment or engraved), grinding groove, PAD	2	0.05
Rockshelter, art (pigment or engraved), grinding groove, undefined artefact site	1	0.03
Rockshelter, art (pigment or engraved), PAD	5	0.13
Rockshelter, art (pigment or engraved), stone arrangement	1	0.03
Rockshelter, art (pigment or engraved), undefined artefact site	5	0.13
Rockshelter, grinding groove, midden, undefined artefact site	1	0.03
Rockshelter, low density artefact scatter (<20)	2	0.05
Rockshelter, PAD	4	0.10
Rockshelter, undefined artefact site	6	0.16
Stone arrangement	2	0.05

Site type	Number (n)	% of total
Stone arrangement, Aboriginal resource and gathering, undefined artefact site	1	0.03
Stone arrangement, grinding groove	1	0.03
Stone quarry, low density artefact scatter (<20)	1	0.03
Undefined artefact site	1,255	32.74
Undefined artefact site (no site card)	3	0.08
Undefined artefact site, PAD	35	0.91
Undefined artefact site, stone quarry	1	0.03
Water hole	1	0.03
<b>HTP North</b>	<b>2,816</b>	<b>73.56</b>
<b>HTP Central</b>		
Aboriginal ceremony and dreaming	1	0.03
Aboriginal resource and gathering, Aboriginal ceremony and dreaming	2	0.05
Art (pigment or engraved)	7	0.18
Art (pigment or engraved), habitation structure	2	0.05
Burial	1	0.03
Ceremonial ring (stone or earth)	1	0.03
Culturally modified tree (carved or scarred)	12	0.31
Grinding groove	64	1.67
Grinding groove, habitation structure	1	0.03
Grinding groove, undefined artefact site	2	0.05
Grinding grooves, stone quarry	1	0.03
Habitation structure	1	0.03
Habitation structure, PAD	2	0.05
Isolated artefact, shell	1	0.03
Isolated find	91	2.37
Isolated find, PAD	18	0.47
Low density artefact scatter (<20)	44	1.15
Low density artefact scatter (<20), PAD	5	0.13
Midden, low density artefact scatter (<20)	1	0.03
Midden, undefined artefact site	5	0.13
Moderate density artefact scatter (21–50)	10	0.26
Moderate density artefact scatter (21–50), PAD	2	0.05
Ochre quarry	1	0.03

Site type	Number (n)	% of total
PAD	4	0.10
Rockshelter, art (pigment or engraved)	76	1.98
Rockshelter, art (pigment or engraved), Aboriginal ceremony and dreaming	1	0.03
Rockshelter, art (pigment or engraved), Aboriginal ceremony and dreaming, PAD	1	0.03
Rockshelter, art (pigment or engraved), grinding groove, hearth, undefined artefact site	1	0.03
Rockshelter, art (pigment or engraved), grinding groove, undefined artefact site	1	0.03
Rockshelter, art (pigment or engraved), hearth	2	0.05
Rockshelter, art (pigment or engraved), PAD	2	0.05
Rockshelter, art (pigment or engraved), stone arrangement	1	0.03
Rockshelter, art (pigment or engraved), undefined artefact scatter	1	0.03
Rockshelter, art (pigment or engraved), undefined artefact site	7	0.18
Rockshelter, grinding groove, undefined artefact site	1	0.03
Rockshelter, hearth	1	0.03
Rockshelter, hearth, low density artefact scatter (<20)	2	0.05
Rockshelter, hearth, non-human bone and organic material	2	0.05
Rockshelter, hearth, undefined artefact site	2	0.05
Rockshelter, PAD	3	0.08
Rockshelter, undefined artefact site	5	0.13
Rockshelter, undefined artefact site, PAD	1	0.03
Stone arrangement	1	0.03
Undefined artefact site	169	4.41
Undefined artefact site, PAD	11	0.29
Water hole	1	0.03
<b>HTP Central</b>	<b>571</b>	<b>14.90</b>
<b>HTP South</b>		
Aboriginal ceremony and dreaming	2	0.05
Aboriginal ceremony and dreaming, rockshelter, art (carved or scarred)	1	0.03
Aboriginal ceremony and dreaming, rockshelter, art (carved or scarred), PAD	1	0.03
Art (pigment or engraved)	21	0.55
Art (pigment or engraved), habitation structure, Aboriginal ceremony and dreaming	1	0.03
Culturally modified tree (carved or scarred)	13	0.34
Grinding groove	38	0.99
Grinding groove, Aboriginal ceremony and dreaming	1	0.03

Site type	Number (n)	% of total
Grinding groove, undefined artefact site	1	0.03
Grinding groove, water hole	1	0.03
Grinding grooves, undefined artefact site	1	0.03
Habitation structure, Aboriginal ceremony and dreaming, PAD	1	0.03
Hearth	1	0.03
High density artefact scatter (>50)	7	0.18
High density artefact scatter (>50), PAD	2	0.05
Isolated find	67	1.75
Isolated find, PAD	1	0.03
Low density artefact scatter (<20)	40	1.04
Low density artefact scatter (<20), PAD	1	0.03
Moderate density artefact scatter (21–50)	2	0.05
Moderate density artefact scatter (21–50), PAD	1	0.03
PAD	2	0.05
Rockshelter (no cultural markers)	3	0.08
Rockshelter, art (pigment or engraved)	89	2.32
Rockshelter, art (pigment or engraved), grinding groove, PAD	1	0.03
Rockshelter, art (pigment or engraved), low density artefact scatter	1	0.03
Rockshelter, art (pigment or engraved), PAD	6	0.16
Rockshelter, art (pigment or engraved), undefined artefact site	1	0.03
Rockshelter, burial, art (pigment or engraved), undefined artefact site	1	0.03
Rockshelter, PAD	1	0.03
Rockshelter, undefined artefact site	1	0.03
Stone arrangement, Aboriginal ceremony and dreaming	1	0.03
Undefined artefact site	123	3.21
Undefined artefact site, PAD	6	0.16
Water hole	5	0.13
Water hole, Aboriginal ceremony and dreaming	1	0.03
<b>HTP South</b>	<b>446</b>	<b>11.64</b>
<b>Grand total</b>	<b>3,833</b>	<b>100</b>





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