
**Plate 1**: View to the south over the Project Area. Note the dense vegetation.

**Plates 2 and 3 below**: View of Redbank Creek vegetation.

**Plates 4 and 5**: View of thick grasses in open paddocks.

## 4.3 TEST EXCAVATION

Due to the anticipated constraints posed by low ground surface visibility (GSV) as a result of dense vegetation across the Project Area, a programme of archaeological test excavation is likely to be required. The need for and location of test excavation investigations will be informed by the results of the Aboriginal heritage survey. These locations and the extent of investigation anticipated will be communicated to Registered Stakeholders following the completion of the survey component of the archaeological assessment.

A programme of test excavation will be utilised to understand more completely the nature of sub-surface archaeological deposits and their integrity and/or extent within the impact footprint which will then inform a determination of the archaeological significance of sites and/or sensitive landforms identified during the survey, and hence future management of the area in terms of the proposed Project impacts.

The aims are therefore to:

1. Establish the extent and nature the of sub-surface archaeological deposits within the Project's impact footprint;
2. Use the data gained from the test excavation programme to better evaluate the archaeological significance and potential of the area; and
3. Develop, in consultation with the registered Aboriginal parties (RAPs), an informed management strategy for the site in the face of the proposed impacts.

Excavations undertaken as per the Code do not require an Aboriginal Heritage Impact Permit (AHIP) under the NPW Act.

### 4.3.1 Test Excavation Methodology

This document sets out the generic proposed methodology for these test excavations and follows the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010). The final test excavation methodology will be informed by the results of the survey component of the archaeological assessment.

The following outlines the sampling strategy for test excavation in compliance with Requirement 16 of the Code (DECCW 2010:26):

1. Test excavation units must be placed on a systematic grid appropriate to the scale of the area - either potential archaeological deposit (PAD) or identified site - being investigated e.g. 10 metre intervals, 20 metre intervals, or other justifiable and regular spacing.
2. Any test excavation point must be separated by at least 5 metres.
3. Test excavations units must be excavated using hand tools only.
4. Test excavations must be excavated in 50 centimetre x 50 centimetre units.

5. Test excavations units may be combined and excavated as necessary to understand the site characteristics, however:
    a. the maximum continuous surface area of a combination of test excavation units at any single excavation point conducted in accordance with point 1 (above) must be no greater than $3m^2$;
    b. the maximum surface area of all test excavation units must be no greater than 0.5% of the area—either PAD or site—being investigated.
6. Where the 50 centimetre x 50 centimetre excavation unit is greater than 0.5% of the area then point 5 (ii) does not apply.
7. The first excavation unit must be excavated and documented in 5 centimetre spits at each area - either PAD or site - being investigated. Based on the evidence of the first excavation unit, 10 centimetre spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.
8. All material excavated from the test excavation units must be sieved using a 5 millimetre aperture wire-mesh sieve.
9. Test excavation units must be excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile.
10. Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects must be made for each single excavation point.
11. Test excavations units must be backfilled as soon as practicable.
12. Following test excavation, an Aboriginal Site Impact Recording form must be completed and submitted to the AHIMS Registrar as soon as practicable, for each AHIMS site that has been the subject of test excavation in accordance with the requirements of the Code.

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## REFERENCES

DECCW 2010 — DECCW. 2010. *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water, Sydney.

Burke & Smith 2004 — Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.

### 11.3.9 Additional Archaeological Survey Methodology

Environmental and Heritage Management P/L

# ADDITIONAL STUDY AREA

## ABORIGINAL HERITAGE SURVEY METHODOLOGY

**UNITED OPEN CUT PROJECT**

GLENCORE

SINGLETON LOCAL GOVERNMENT AREA

MAY 2015

PREPARED BY
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Preliminary discussions will be held during each field survey day regarding the day's findings, including any specific identified cultural values. Discussions will also canvas the possible significance and management of Aboriginal heritage sites recorded and culturally acceptable mitigation measures that might be considered.

Records of sites identified and the outcomes of cultural heritage discussions in the field will be recorded in writing, summarised and circulated to all registered stakeholder groups as a fieldwork summary following the completion of the survey program.

Survey results for the additional areas will be collated and reviewed against previous archaeological studies so as to best understand the current landscape condition and archaeological potential of the Additional Study Area with a view to determining the most appropriate locations for any sub surface investigations required. The test excavation plan, elements of which will have been discussed during the survey, will then be circulated to the RAPs and Knowledge Holders for comment prior to sub surface investigative works occurring.

OzArk will prepare a draft report based on the results of all field assessments (surface and sub-surface) regarding the recorded sites and their proposed management. RAPs and Knowledge Holders will be invited to review this draft report and provide comment within a given time frame and feedback will be included in report finalisation and provided as an appendix to the final report.

A copy of the final report, or advice of its availability, will be provided to each RAP / Knowledge Holder prior to United Collieries submitting it to the relevant authorities.

## 2.2 THE ADDITIONAL STUDY AREA

The Additional Study Area comprises two land parcels within the Wambo Coal lease areas: one portion to the northwest of United Colliery and another to the south (**Figures 1** and **2**). The Additional Study Area is bordered by the approved disturbance footprint of Wambo Coal's Open Cut mine development which was assessed as part of Wambo Coal's 2003 Environmental Impact Statement.. Some of this Additional Study Area has already undergone archaeological assessment in the past and some of the previously recorded sites (**Figure 4**) have had Section 90 impact permits enacted over them. Conversely, small portions of the Additional Study Area may never have been the subject of archaeological assessment in the past.

In general, this archaeological assessment will evaluate the archaeological potential of landforms within the proposed Additional Study Area, attempt to reassess any previously recorded sites that are thought to remain intact within the Additional Study Area and record any previously unrecorded Aboriginal sites that may be found as a result of the survey. The survey component will also serve to review current landscape condition against that documented in prior archaeological reports to determine where sub-surface investigations should be targeted.

# 1 INTRODUCTION

As all Registered Aboriginal Parties (RAPs) and Knowledge Holders for the United Project are aware, OzArk Environmental & Heritage Management (OzArk) is undertaking the Aboriginal archaeological assessment for the United Open Cut Project (the Project).

Survey over the original study area (**Figure 1**) for the Project took place over 16 days from late March 2015 through to the end of April 2015. A summary of the survey to date has been sent to all Registered Aboriginal Parties (RAPs) and Knowledge Holders and we thank all participants for the success of the survey to date.

Glencore have now identified that some additional land parcels, totalling approximately 65 hectares, that will be impacted by the Project (Additional Study Area). The Additional Study Area is shown in **Figure 1.**

# 2 ARCHAEOLOGICAL ASSESSMENT APPROACH

The Aboriginal archaeological assessment for the Additional Study Area will be undertaken following the same survey methodology as set out for the original study area. which was sent to all RAPs prior to the commencement of the first phase of survey at United Colliery. This methodology is in compliance with the NSW Office of the Environment and Heritage (OEH) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010) and the *Guide for Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). These guidelines have been developed to support the process of investigating and assessing Aboriginal cultural heritage. They specify the minimum standards for archaeological investigation undertaken in NSW under the *National Parks and Wildlife Act 1974*. The Aboriginal cultural heritage assessment and archaeological investigation are to be undertaken in accordance with the requirements of these documents.

## 2.1 ARCHAEOLOGICAL SURVEY

The Additional Study Area is within the same environmental and archaeological context as was reviewed in the original survey methodology document which has been circulated to RAPs and Knowledge Holders and hence will not be repeated here.

Any preliminary cultural values which may be provided by RAPs and Knowledge Holders that may affect the implementation of this methodology will be incorporated into the final draft of this document.

In line with the surveys undertaken to date on this Project, all field assessments will include archaeologists from OzArk and RAP / Knowledge Holder representatives working on a roster managed by United Collieries.

The results of the archaeological assessment will be added to the report already in preparation for the original study area. This report will include recommendations for future archaeological management of areas and/or sites within the Additional Study Area. These recommendations will be based on both the assessed archaeological significance of an area, as well as from information and suggestions gained through discussions that will be held in the field on an on-going basis with all RAP / Knowledge Holder representatives present on the survey.

## 2.3 SURVEY

### 2.3.1 Survey Methodology

Standard archaeological field survey and recording methods will be employed in this assessment as per Burke & Smith 2004.

The field assessment will be undertaken over the entire disturbance footprint. This assessment will include the re-visiting and re-recording of any previously recorded sites and where appropriate re-visit sites within 50 metres of the Additional Study Area to ensure that the site does not extend into areas where proposed impacts are to occur.

It is envisioned that fieldwork for the Additional Study Area will take approximately three to five days of field survey.

The survey will take the form of pedestrian transects over the Additional Study Area. This includes areas that are previously unassessed and areas with potentially high potential archaeological values. This intensive survey coverage will include:

- Pedestrian field survey to identify and record any Aboriginal archaeological sites within the landscape, and to record any areas that may have potential to have subsurface Aboriginal artefacts present.

- Field survey will, wherever possible, be conducted in transects of 50-100 metre intervals (with up to ten recorders spaced approximately five to ten metres apart). If field conditions do not allow straight transects, some areas may be investigated more opportunistically where exposures and/or vegetation allow. Please note that the methodology set out here is an ideal that is not always possible to follow in areas of dense vegetation and/or steep terrain. While every effort will be made to maintain a systematic survey transect pattern, it is understood that this is not always possible. However, even in areas of heavy vegetation, every effort will be made to intensively survey available exposures and/or areas of higher archaeological sensitivity such as along creek lines.

- If areas have significant levels of ground cover and pedestrian survey is considered by the archaeologist and RAP / Knowledge Holder representatives to yield no results,

then assessment will be made, based in part on knowledge gained from past archaeological research in the area, of the potential of the area to have Aboriginal artefacts present.

Should survey effort be impacted by low ground surface visibility, a greater amount of sub-surface test excavation will be used to investigate archaeological potential.

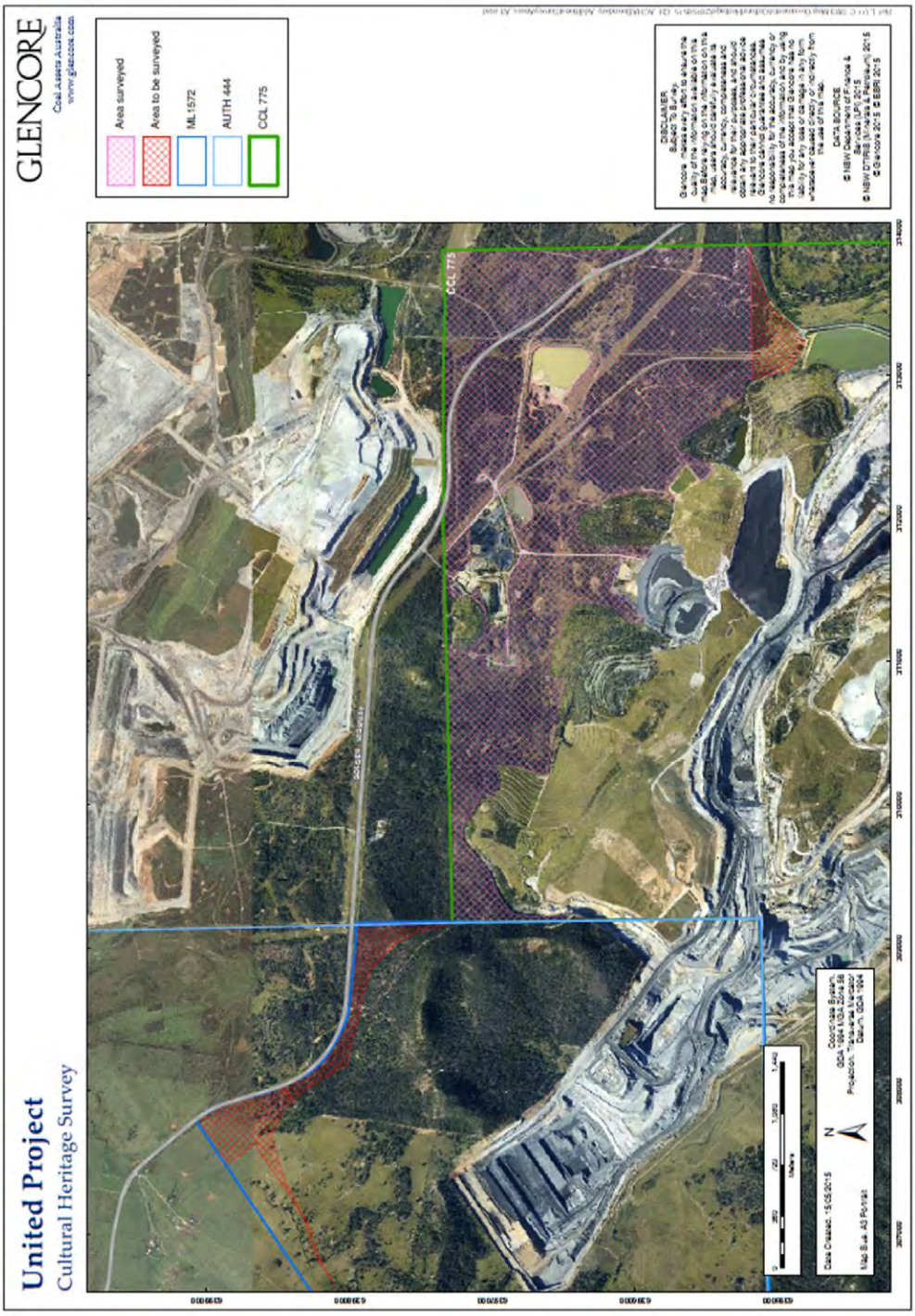


**Figure 1: Additional Study Area shown in red with the original survey area shown in purple.**

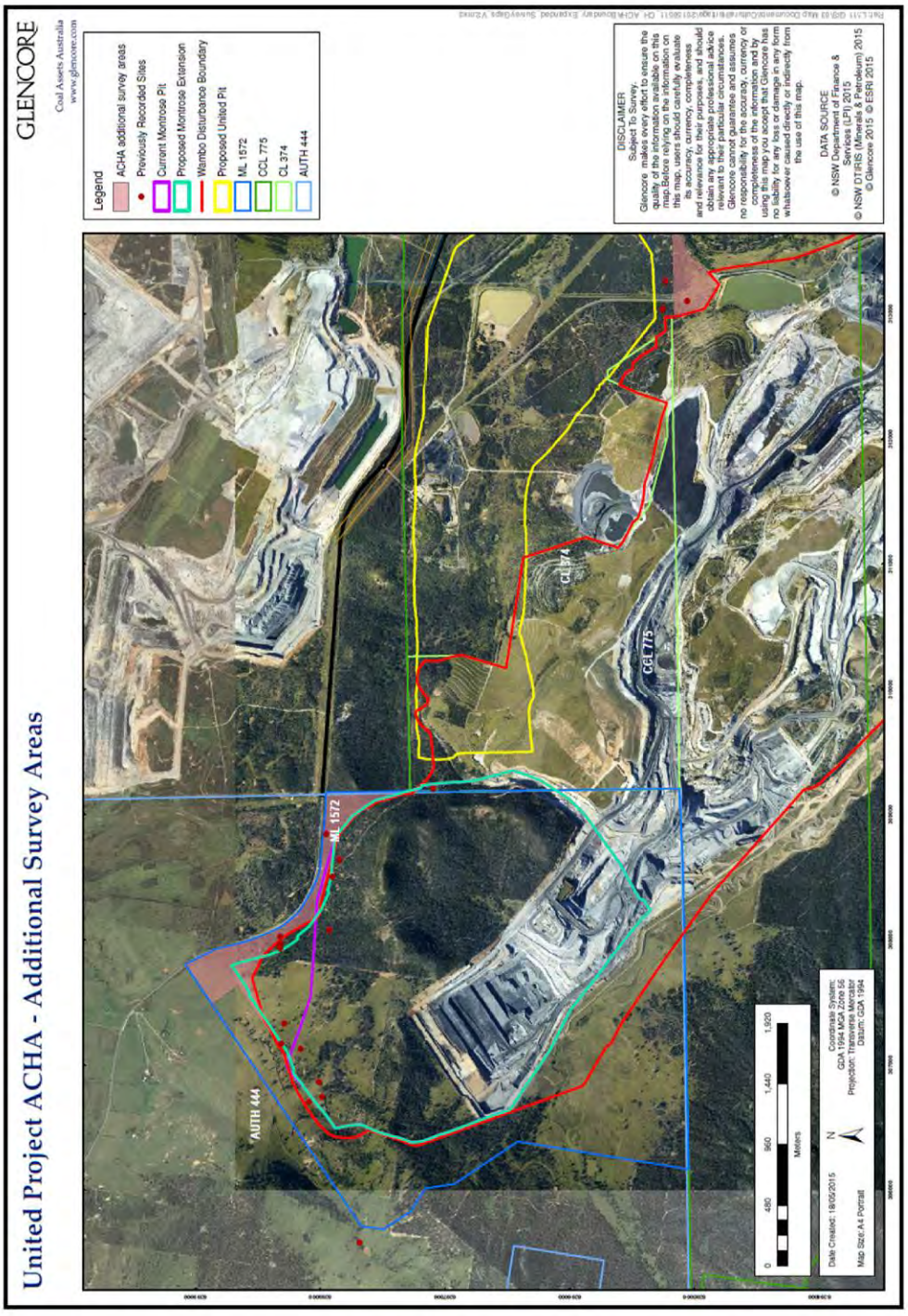


**Figure 2: AHIMS recorded sites in proximity to Additional Study Area.**

## REFERENCES

DECCW 2010 — DECCW. 2010. *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water, Sydney.

Burke & Smith 2004 — Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.

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### 11.3.11 Feedback from Tocumwal - 10 June 2015

Tocomwall

Mathew Goddard

Approvals Coordinator

Glencore Coal Assets Australia

Via email: Mathew.Goddard@glencore.com.au

10 June 2015

Dear Mathew,

**Re: Review of Aboriginal Heritage Survey and Test Excavation Methodology. Ozark Environmental and Heritage Management P/L. May 2015.**

Tocomwall has reviewed the Archaeological Survey Summary prepared by Ozark and agrees with the findings.

Tocomwall has read the Aboriginal heritage survey methodology for an 'Additional Study Area' prepared by Ozark and agrees with the proposed methodology. We also understand, based on discussions with yourself and Ben Churcher from Ozark, that the test excavation methodology will include a geoarchaeological component. This geoarchaeological component will consist of a borehole investigation aimed at identifying the nature, depth and lateral extent of Potential Archaeological Deposits (PAD) across the study area. Tocomwall understands that the borehole program will seek to identify:

1. The presence or absence of 'overburden' in the form of post-Contact sediment blankets;
2. The presence or absence of $A_1$ and $A_2$ soil horizons, including their depth and lateral extent, since these represent PAD;
3. Mapping of these deposits in cross section and horizontal extent; and
4. The nature and extent of deposits identified in points 1-3 above will guide the strategy employed during the testing program.

Tocomwall are also happy to provide assistance to Ozark in preparing the geoarchaeological research design and methodology.

Tocomwall understands that the additional archaeological survey will commence on Monday 22 June for a period of between three to five days.

Any staff that will be rostered by Tocomwall to attend the additional survey have undergone a Glencore Generic Induction and a United Collieries Site Induction.

Please call if you have any questions.

*Integrating Landscape Science & Aboriginal Culture Knowledge For Our Sustainable Future* | 1

Regards,

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Senior Archaeologist
On behalf of:

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### 11.3.12 Feedback from Tocumwal - 8 July 2015

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Mathew Goddard

Approvals Coordinator

Glencore Coal Assets Australia

Via email: Mathew.Goddard@glencore.com.au

8 July 2015

Dear Mathew,

**Re: Review of the Test Excavation Methodology. Ozark Environmental and Heritage Management P/L. June 2015.**

**Introduction**

This letter represents Tocomwall's review of the proposed Ozark archaeological test excavation methodology. It includes specific comments with regards to the methods that are proposed and identifies additional detail that would need to be incorporated for certain aspects of the fieldwork to be completed successfully. Please note that this is only a review: it does not provide specific detail but rather provides direction on what needs to be added to the program. This letter should also be read in conjunction with Tocomwall's original review of the Ozark methodology dated March 2015 as many of the comments here follow on from the initial review.

The premise of this review is that archaeology is in essence a stratigraphic based discipline that incorporates elements of geology, stratigraphy, sedimentology, soils and geomorphology. Understanding the archaeological sequence and therefore identifying the nature, extent and significance of deposits must be preceded by studies that describe the stratigraphic sequence. This is usually identified by geoarchaeological[1] methods of investigation.

**Predictive Model**

Currently, there is no predictive model explicitly identified in the methodology. In Ozark's document *Aboriginal Heritage Survey and Test Excavation Methodology: United Open Cut* (March 2015), a basic predictive model was identified, but it included the proviso that (pp12):

*'An overview of the predictive model for subsurface test excavation survey will be included in the test excavation scope and plan distributed to RAPs and Knowledge Holders after the surface survey has been completed.'*

This has not been included in the current document. Tocomwall would like to see a revised predictive model included in the test excavation methodology. In addition, we would like the

[1] On page 12 of the Ozark methodology the program is identified as a 'geotechnical auger program.' To clarify the terminology: geotechnical investigations are undertaken in order to classify soils and bedrock for engineering purposes; borehole data from such studies can be useful however in providing information of the nature, depth and extent of unconsolidated deposits, but are not specifically aimed at investigating stratigraphy per se. The current Ozark methodology will be conducting geoarchaeological investigations in order to specifically inform the test excavation strategy in regard to the nature, variability, depth and extent of PAD and the stratigraphic profile of the study area.

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predictive model to take into account some of the following suggestions in order to refine this model.

The predictive archaeological model that is usually invoked for the Redbank Creek area (and the Hunter Valley in general) in regard to deposits considers that – based on soil profile development – topsoils reflect Holocene-aged sequences and subsoils represent Pleistocene stratigraphic sequences (e.g. Koettig and Hughes 1983; see in particular Walker, P.H. 1989. Contributions to the Understanding of Soil and Landscape Relationships. In *Australian Journal of Soil Research, 27, 589-60*). However, this model is rarely, if ever, actually tested because virtually all sub-surface test excavation programs target 'Holocene' contexts. To actually test the theory, an excavation program must also include areas for inclusion into the program where the expectation is that archaeology is absent. In the context of the study area, this should include areas of the flat ridge topography either side of the creekline as well as areas where subsoil horizons are exposed (which means that overburden and topsoils do not need to be excavated or removed prior to testing), amongst others.

Predictive archaeological models for the Hunter Valley usually orientate themselves along avenues of inquiry that include absence or presence as well as distance to water, geology (e.g. sandstone for rockshelters or grinding grooves), geomorphology (e.g. eroding steep hillsides are unlikely to retain significant *in situ* archaeology), topography and aspect (e.g. elevated flat landforms with access to water and sunlight), proximity to resources (e.g. outcrops for raw materials) and high artefact numbers (e.g. areas where a 'low' number of artefacts are identified are usually abandoned for testing for areas with 'high' numbers of artefacts). The nature of hunter-gatherer settlement patterns is rarely given much thought since the bias for sampling is usually directed towards sites with high artefact densities and this obviously skews results[2]. Tocomwall would like to see a predictive model that includes considerations of chronology, depositional and post-depositional changes, seasonality, gender-specific activities, function, consideration of 'off-site' archaeological models, in addition to formulating a strategy for investigating Pleistocene and Holocene settlement patterns looking at intensification and whether it can be identified in the archaeological record of Redbank Creek.

Suggested reading that should be included to pursue these avenues of inquiry include (not an exhaustive list):

Attenbrow, V. 2003. Habitation and land-sue patterns in the Upper Mangrove Creek Catchment, NSW Central Coast, Australia. In *Australian Archaeology 57: 20-32.*

Beaton, A. 1983. Does intensification account for changes in the Australian Holocene archaeological record. In *Archaeology in Oceania 18: 94-97.*

Binford, L.R. 1980. Willow smoke and dog's tails: hunter-gatherer settlement systems and archaeological site formation. In *American Antiquity Vol.45: 4-20.*

[2] Hunter-gatherer societies spread their activities across landscapes based on considerations of seasonality (e.g. availability of certain fruits), gender-specific activities (e.g. hunting verses seed gathering) and function (e.g. base camp, hunting stand, kill site, raw material outcrop etc) etc.

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David, B and H. Lourandos. 1999. Landscapes as mind: land use, cultural space and change in north Queensland prehistory. In *Quaternary International 59: 107-123.*

Foley, R. 1981. Off-site archaeology: an alternative approach for the short-sited. In *Pattern of the Past: Studies in Honour of David Clarke. CUP.*

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Hiscock, P. 1981. Comments on the use of chipped stone artefacts as a measure of "intensity of site usage." In *Australian Archaeology 13: 20-34.*

Hiscock, P. 2001. Sizing up prehistory: sample size and composition of artefact assemblages. In *Australian Aboriginal studies 2001/1: 48-62.*

Rowland, M. 1989. Population increase, intensification or a result of preservation? Explaining site distribution patterns on the coast of Queensland. In *Australian Aboriginal studies 1982/1: 32-42.*

**Auger Program**

The Ozark methodology has identified the need for an auger program and has broadly indicated avenues to explore. However, the research design and methodology needs to reflect a more specific strategy in order to demarcate explicit research questions and identify the relevant descriptive framework (methods) that will be employed to achieve these goals. Tocomwall respectfully suggests the following additional information should be supplied in order to progress the program.

*Research Design*

This should formulate some very specific questions in order to provide a framework of enquiry for the subsequent methodology. Consideration of various parameters should include (but necessarily be limited to) the following topics:

*Identification of short-term verses long-term climatically induced valley evolution and its implications for the geoarchaeology of Aboriginal settlement patterns at Redbank Creek.*

This can be summarised by alluding to two different approaches utilised in Australian floodplain studies. Nanson, G.C (1986. Episodes of vertical accretion and catastrophic stripping: a model of disequilibrium flood-plain development. In *Bulletin of the American Geological Society 97: 1467-75*) identified the process of channel change causing a dramatic change to the entire floodplain system and identified four stages in his disequilibrium-stripping model. Depending on what stage of 'evolution' the system is in can have dramatic consequences for the visibility, preservation and nature of the archaeological record. Erskine, W.D. and Warner, R.F (1988. Geomorphic effects of alternating flood and drought dominated regimes on NSW coastal rivers. In *R.F. Warner (ed) Fluvial Geomorphology of Australia, Academic Press: 223-239*) on the other hand identified morphological change as being influenced by short-term changes (circa 50 year cycles) caused by alternating periods of flood- or drought-dominated regimes. This second model (and other studies – particularly by Erskine around the Hunter Valley) has clearly demonstrated the dramatic effects of post-Contact landscape evolution. Both models need to be considered because they clearly demonstrate the

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problems with assuming all major landscape changes are astronomically forced climate changes: short-term evolution (in particular post-Contact) can produce equally 'dramatic' changes. These landscape changes are particularly relevant in relation to Redbank Creek: for example, in Koettig and Hughes (1983) study, Figure 16 (which illustrates the cross-section of topography associated with Redbank Creek 5) clearly shows channel migration of around 70m (northward) and entrenchment in the order of 1.5-2.0m.

Apart from anything else, consideration of these models will inform the overall geomorphology of the study area, identify basic chronosequences that can be used to provide relative dating of various landforms across the study area, as well as aid in the clarification of primary and secondary contexts. These are essential in assigning significance criteria.

*The identification of buried soils and paleosols.*

This needs to be explored in more detail with regard to distinguishing soils from paleosols. For example, why is this important and what significance does it have for the archaeological record? What value will this distinction add to the overall process and how can this data be captured efficiently?

This framework of enquiry will also help the identification of unusual, rare and/or highly significant archaeological deposits. It will also provide the means to invigorate the fieldwork. There is both a complacency and tendency by archaeologists to expect 'more of the same' and without appropriate measures being put into place beforehand, the methodologies are rarely flexible enough to capture the potential for variability. As indicated by observations along the entrenched channel of Redbank Creek, evidence exists of channel migration and erosion, as well as depositional landforms. How can this data be expanded upon and what mechanisms will be put into place to ensure that both similar and different profiles can be identified quickly and efficiently?

*Appropriate consideration of the resolution (scale) of the proposed study.*

For example, purely 'geomorphic' investigations are often undertaken on a broader landform pattern land system resolution and whilst providing useful frameworks for archaeological investigations are rarely fine-grained enough to provide resolution at landform element and consequently archaeological site scales. Consideration needs to be factored in of micro- and meso-scale investigations and how this will be realised.

*Methodology*

The methodology needs to clearly define the relevant 'techniques' that need to be applied during the fieldwork. For example, should the descriptive methods record litho-facies or soil horizons: which approach will provide the necessary efficiency as well as the required information?

*Recording of Sections.*

Prior to instigating the auger program on the floodplain of Redbank Creek, exposed sections within the channel should be cleaned up, photographed and described. This is important, as it will provide the 'baseline data' for the auger program. This can be used to help identify the extent of deposits as well as enable variation to be picked up.

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*How will buried soils and paleosols be identified in the field?*

What specific descriptive parameters will be incorporated into the methodology to allow for this and are there any simple ways that these parameters can be described and interpreted in the field? Does lab work need to be considered?

*The identification of proxy data.*

Are there any additional forms of data that may need to be considered to increase the resolution and therefore build on the significance assessment of deposits and archaeological sites? Examples include chronology (e.g. C14, OSL and TL dating techniques) and palaeo-vegetation reconstruction - incorporating biostratigraphic potential.

**Conclusion**

Tocomwall would like to conclude that Redbank Creek is a significant cultural, archaeological and scientific area. The attachment to Place that the PCWP's member's have and the high cultural values they assign to it needs to be considered in the archaeological process. Cultural heritage and archaeology are more than simply 'bones and stones' and what is in essence an approach by consultants that reflects 'artefact mining'. The heritage process should be about welding what are complimentary values: cultural, archaeological and environmental aspects. This review has been structured to be sympathetic to that approach and commentary on the proposed testing program written to help achieve that connection. Redbank Creek has incredible potential for answering very significant questions on the both the ancestral and contemporary PCWP values, in addition to contributing to a greater archaeological understanding of the area and indeed, the Hunter Valley in general. Tocomwall hopes that the review has been helpful and that the questions raised are explored and incorporated into a revised research design and methodology for the proposed test excavation program.

Please feel free to call me should you have any questions.

Regards,

Jakub Czastka (Chaz)
Senior Archaeologist
On behalf of:

Scott Franks
Tocomwall Pty Ltd
m: 0404 171544
p: 02 9542 7714
f: 02 9524 4146
e: scott@tocomwall.com.au

### 11.3.13 Archaeological Test Excavation Comments - Response to PCWP

UNITED
COLLIERIES
GLENCORE

23 July 2015

Scott Franks
Tocomwall Pty Ltd
PO Box 76
Caringbah NSW 1495

CC: Jakub Czastka

**RE: Tocomwall review of the Test Excavation Methodology – Glencore United Collieries**

Dear Scott,

In response to Tocomwall's review of the draft Test Excavation Methodology, both United and OzArk largely agree with the comments set out by Tocomwall and appreciate the rigor and professionalism of the review and feedback provided. Our response to Tocomwall's review and details of the subsequent inclusions in the finalised test excavation methodology are provided below.

The test excavation methodology was framed with an understanding of the legislative constraints under which a test excavation program may be conducted. To quote from the guidelines (*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW: Section 3.1*), the purpose of test excavation is:

> *To collect information about the nature and extent of sub-surface Aboriginal objects, based on a sample derived from sub-surface investigations. Test excavations contribute to the understanding of site characteristics and local and regional prehistory and they can be used to inform conservation goals and harm mitigation measures for the proposed activity.*

In addition, the guidelines provide strict limitations on how much of a site may be excavated and that *"due care must be taken when excavating and collecting objects and unnecessary excavations do not comply with this Code"* (Code of Practice: 3.1).

As expressed explicitly by the Code, the purpose of a test program is to:

1. Contribute to the understanding of site characteristics and local and regional prehistory (i.e. are intact archaeological deposits extant and how representative are they to other archaeological investigations at United and in the region); and
2. Inform conservation goals and harm mitigation measures for the proposed activity (i.e. to allow the archaeological values of an area to be better known so that appropriate recommendations can be made in the ACHA).

Therefore United and OzArk understands that the purpose of test excavation is to expressly determine:

1. Is a site present? (i.e. in areas where the predictive model suggests that a site may be present – such as along a major waterway – but where the ground surface cannot be accurately assessed due to ground cover); and
2. The nature and extent of a site (i.e. do visible artefacts in an erosion scald extend into non-eroded portions of a site and do these deposits retain archaeological integrity).

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Thus the current test excavation program has been framed to explore the outcomes as set out in the Code of Practice either by:

1. Carrying out test excavation adjacent to known artefact concentrations; and
2. Carrying out an auger program to determine likely site locations in areas where either:
    a. Survey suggested soils are too thin to contain intact subsurface deposits; or
    b. In areas where ground surface visibility is too low to accurately assess the archaeological potential of an area.

The Tocomwall response contains many worthy outcomes from an archaeological project such as that being undertaken at United such as:

- chronology;
- depositional and post-depositional changes;
- seasonality;
- gender-specific activities;
- function;
- investigating Pleistocene and Holocene settlement patterns; and
- Holocene intensification.

All these outcomes are valid and would be within OzArk's attempt to interpret the area but United and OzArk do not believe a test excavation program, as defined by the Code of Practice, can be framed to adequately examine such theoretical questions. Rather, United and OzArk feel that if the limited test excavation program indicates that there may be archaeological data present that could investigate such outcomes that this be framed into the salvage methodology should Project approval be forthcoming.

Due to past archaeological investigations at United, including extensive sub-surface investigations by Koettig and Hughes in the early 1980s, the archaeological values at United are (largely) already known and the purpose of the current test excavation is to determine if this value remains valid (i.e. do archaeological deposits continue to retain integrity that support the already recognised archaeological values).

The auger program as set out in the test excavation methodology, as well as the actual test excavation, will help determine if features such as buried soil layers are rare or common at United. Should the results indicate that such features are common (and they are of archaeological interest), then an appropriate methodology will be framed in the ACHA to further explore these features should Project approval be forthcoming. If Project approval is not forthcoming, these features will not be further explored as there will be no approved impact. However, it is not the stated role of test excavation to fully elucidate on all archaeological and geomorphological features at United: only, in a limited way, to provide data to such an extent to allow the archaeological values at United to be determined and to frame appropriate conservation/mitigation policies should impact be approved.

It is under this understanding that the test excavation methodology is framed - to be both within the legislative guidelines and to further our understanding of the current archaeological values at United. United and OzArk will attempt to obtain valid information from the archaeological investigation to try to answer as many 'questions' as is possible. United and OzArk however see this as a staged process whereby survey and test excavation are to assess current condition and values, while it is the role of salvage excavation (should it occur) to investigate archaeological deposits more broadly and more intensively.

In conclusion United and OzArk agree with Tocomwall that *"Redbank Creek has incredible potential for answering very significant questions on both the ancestral and contemporary PCWP values, in addition to contributing to a greater archaeological understanding of the area and indeed, the Hunter Valley in general."*

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However, United and OzArk stress that it is beyond the gazetted confines of test excavation to expect that this program alone will provide all obtainable information. Further, the purely geomorphological investigations as set out in Tocomwall's response (such as on page 3: *Identification of short-term verses long-term climatically induced valley evolution and its implications for the geoarchaeology of Aboriginal settlement patterns at Redbank Creek*) is beyond the scope of an archaeological test excavation, and while such features may come to light as a result of the auger program, the primary aim of the program is to identify archaeological deposits, not to map detailed colluvial changes at United. Further, United and OzArk undertake to retain indicative soil samples from the auger program, correctly logged and labelled, so that further studies on the soil can be undertaken (such as those listed on pages 4-5 of the Tocomwall response) if appropriate.

In response to the Tocomwall review and comments the test excavation methodology has been amended to include the following:

**4.2 PREDICTIVE MODEL (Section added)**

In Section 3.2 of the United Open Cut Project Archaeological Survey Methodology, a predictive model for site location was set out. As set out in Section 2 of this document, the results of the survey largely confirmed the predictive model set out in the survey methodology in that the majority of sites were recorded in close association to water and that sites away from water tend to have a lower artefact density. As such, the predictive model as set out in the survey methodology is used again to determine the best locations for the test excavation program. While it is accepted that this model is 'predictive' and not exclusive, investigative strategies will be employed during the test excavation program, such as deploying the auger program in areas such as flat ridge topography either side of the Redbank Creek, that will further test the veracity of the model.

**Section 4.3.2.1: (Paragraphs added)**

- For those auger test areas adjacent to an incised creek line, exposed sections within the channel should be cleaned up, photographed and described. This will provide the 'baseline data' for the auger program.

- Further, the auger program should include areas of the flat ridge topography either side of the Redbank Creek, as well as areas where subsoil horizons are exposed (which means that overburden and top soils do not need to be excavated or removed prior to testing). This will determine the depth and nature of the B Horizon soils at United and explore whether Pleistocene deposits may be present.

- A representative and labelled sample of soil from selected auger holes at each location should be retained for further study should it be required.

A copy of the finalised Test Excavation Methodology has been included with this correspondence for your records. Please feel free to contact me should you have any questions.

Yours sincerely

Mathew Goddard
Approvals Coordinator
Glencore Coal Assets Australia

### 11.3.14 Final Archaeological Test Excavation Methodology


ARTEFACTS RECORDED ADJACENT TO REDBANK CREEK DURING THE 2015 SURVEY.

**ARCHAEOLOGICAL TEST EXCAVATION METHODOLOGY**

**United Open Cut Project**

**Glencore**

**July 2015**

**Prepared by**
**OzArk Environmental and Heritage Management Pty Ltd**
**for United Collieries (Glencore)**

Environmental and Heritage Management P/L

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## CONTENTS



## FIGURES

# 1 INTRODUCTION

## 1.1 PREAMBLE

OzArk Environmental & Heritage Management (OzArk) would like to acknowledge the Traditional Owners of the area—the Wonnarua people—and pay respect to their cultural heritage, beliefs and continuing relationship with the land.

We pay respect to the Elders, both past and present, for they hold the memories, traditions, culture and hopes of Aboriginal people in the area.

## 1.2 BACKGROUND TO THE TEST EXCAVATION PROGRAMME

The United Collieries lease area is located at Warkworth on the southern side of the Hunter River and lies about 10km southeast of Jerrys Plains. Located in the Upper Hunter Valley of New South Wales, United Colliery is approximately 17km west of Singleton and 33km southeast of Muswellbrook. Redbank Creek flows to the east across the lease area and drains into Wollombi Brook which in turn flows northeast into the Hunter River.

Glencore as manager of the 50:50 production Joint Venture between United (Glencore) & Wambo (Peabody) (the Proponent) is currently in the process of preparing an Environmental Impact Assessment (EIS) for the proposed United and Wambo Open Cut Project (the Project) which involves the development of an Aboriginal and Cultural Heritage Impacts Assessment (ACHA).

As part of the ACHA, OzArk have been engaged to undertake the archaeological assessment of the areas that will be potentially impacted by the Project. The surface archaeological assessment has been completed over the areas of the United Collieries mining lease CCL775 during March and April 2015. An additional surface assessment was carried out over areas associated with the Wambo Coal mining leases in June 2015.

As a result of the surface archaeological assessment of the United Collieries mining lease, a number of locations have been identified that require subsurface test excavations in order to determine the integrity and/or extent of sites recorded during the field assessment.

This document sets out the proposed methodology for these test excavations and follows the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* under Part 6 *National Parks and Wildlife Act 1974* (NPW Act; the Code).

## 1.3 CODE REQUIREMENTS FOR THE TEST EXCAVATION PROGRAMME

The Code lists a number of requirements pertaining to test excavation. These requirements are enumerated below and further information pertaining to these requirements follow in subsequent sections of this document.

**Requirement 14** (Test excavation which is not excluded from the definition of harm):

*Sub-surface investigation will not be excluded from harm where they are carried out in the following areas:*

- *in or within 50m of an area where burial sites are known or are likely to exist*
- *in or within 50m of a declared Aboriginal place*
- *in or within 50m of a rock shelter, shell midden or earth mound*
- *in areas known or suspected to be Aboriginal missions or previous Aboriginal reserves or institutes*
- *in areas known or suspected to be conflict or contact sites.*
    - None of the test excavation locations are known to be located within the vicinity of the items listed under Requirement 14 of the Code.

- **Requirement 15a** (Consultation): As the proposed archaeological test excavation programme is part of the Project, consultation has been ongoing with the Registered Aboriginal Parties (RAPs) and has been completed to the stage described in subclause 80C (6) of the *National Parks and Wildlife Regulation 2009* (NPW Regulation).
- **Requirement 15b** (Test excavation sampling strategy): This document sets out the proposed sampling strategy for the test excavation programme.
- **Requirement 15c** (Notification):
    - *the location of the proposed test excavation and the subject area.*
        - This document sets out the proposed location of the test excavation programme.
    - *the name and contact details of the legal entity with overall responsibility for the project.*
        - United Collieries Pty Ltd, PMB 13, Singleton NSW, 2330
    - *the name and contact details of the person who will be carrying out the test excavations where this is different to the legal entity with overall responsibility for the project.*
        - OzArk Environmental & Heritage Management, 145 Wingewarra St, DUBBO, NSW, 2830
    - *the proposed date of commencement, and estimated date of completion, of the test excavations.*
        - Anticipated Commencement: 27/07/15
        - Anticipated Completion: 14/08/15

Weather permitting, the projected date for the excavations are for three weeks: 27 July to 14 August 2015.

- *the location of the temporary storage location for any Aboriginal objects uncovered during the test excavations.*
  - Aboriginal objects recovered during the excavations will be temporarily housed in a locked container at 21 Agnes Ave, CRESTWOOD, NSW, 2620 (OzArk branch office) as the objects undergo analysis. Following analysis they will be stored in a locked container at United Collieries until such times as a Care and Control agreement is reached by RAPs.

- **Requirement 16a** (Test Excavation): The test excavation programme will adhere to Requirement of 16a as set out in this document (see **Section 4.2**).
- **Requirement 16b** (Objects recovered during test excavations): Aboriginal objects recovered during the excavations will be temporarily housed in a locked container at 21 Agnes Ave, CRESTWOOD, NSW, 2620 (OzArk branch office) as the objects undergo analysis. Following analysis they will be stored in a locked container at United Colliery until such times as a Care and Control agreement is reached by all RAPs.
- **Requirement 17** (When to stop test excavations): the test excavation programme will adhere to the requirements set out in the Code: Any test excavation carried out under this requirement will cease when suspected human remains area encountered; or when enough information has been recovered to adequately characterise the objects present with regard to their nature and significance.

The test excavation methodology for the Project was written by Ben Churcher (Principal Archaeologist, OzArk)

# 2 THE PROJECT AREA

**Figure 2–1** shows the proposed Project Area and some of the main topographical features of the vicinity. The Project Area covers 557 hectares and is the area in which all proposed impacts associated with the United Open Cut Project will be located (impact footprint). For the purposes of this investigation it is assumed that all areas within the impact footprint will be impacted by the proposed Project.

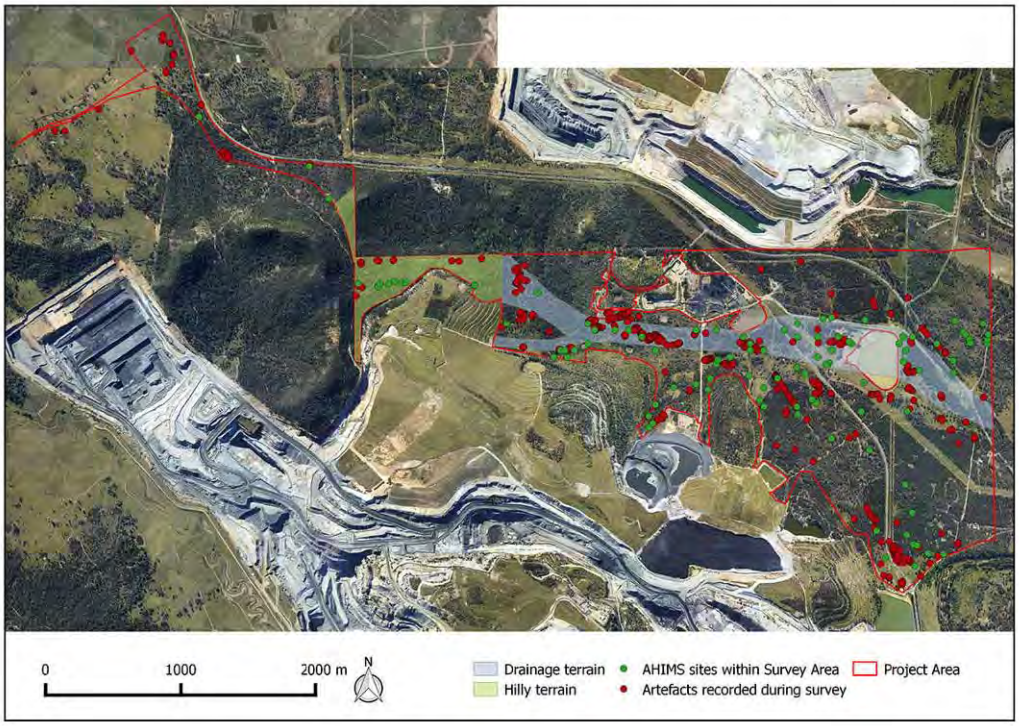
For convenience, the Project Area can be divided into three main areas: hilly terrain, drainage terrain and other areas. These contiguous areas can be briefly characterised as follows:

- Hilly terrain: Approximately 32ha or 5.7 per cent of the Project Area consists mostly of elevated landforms and is located in the west of the Study Area. This topography contains steep slopes in places but is more generally characterised by moderate slopes and ridge lines. This region currently supports an open woodland of regenerated trees with very few mature trees. Rock outcrops are common and in places, particularly in the far west, the mid-storey canopy is very thick and tangled. Soils tend to be very thin due to soil loss when this area was cleared of vegetation.

- Drainage terrain: Approximately 118ha or 21 per cent of the Project Area consists of Redbank Creek, small tributaries and adjacent landforms and is roughly located running east–west across the centre of the Study Area. In the west Redbank Creek flows through a topography of gentle slopes but in the central and eastern portions of the Study Area it flows through a generally flat landscape. The main channel of Redbank Creek is often deeply incised with banks of 2–3 metres. In many areas former channels to Redbank Creek are discernible although these have stabilised with vegetation regrowth in more recent years. Large exposures are restricted to this topographic zone although some areas within this zone have thick regrowth Bull Oak and long grass. As can be seen in **Figure 2–1** the majority of sites (artefacts) recorded during the current survey, as well as previously recorded sites, are associated with this topographic zone.

- Other areas: The remaining 407ha (73.3 per cent) are those portions of the Project Area not included in the above topographic zones and are characterised as being generally flat with poor soils. These areas mostly support regrowth Casuarina although, in a few isolated pockets, larger Eucalyptus trees are present. Exposures are rare in these areas apart from around the numerous artificial disturbances (roads, dams, and electricity easements etc.) that dot the area. These areas are distant to supplies of permanent water.

**Figure 2-1. The Project Area. Major topographic zones.**




The Project Area has been affected by a high degree of disturbance over the past 200 years, primarily as a result of the agricultural and mining history of the region.

Overlaying the major portion of the Project Area (United Collieries mining lease CCL775) on a 1963 aerial of the landscape now occupied by United Collieries (**Figure 2–2**) displays the following landscape features:

- Extensive vegetation clearing has occurred;
- Stands of vegetation are extant only in isolated pockets and along Redbank Creek;
- Redbank Creek displays a multi-channel morphology and signs of extensive erosion; and
- There are large areas of sheetwash exposures adjacent to Redbank Creek.

Overlaying the Project Area (United Collieries mining lease CCL775) on an aerial taken in approximately 1987 of the landscape now occupied by United Collieries (**Figure 2–3**) displays the following landscape features:

- Mining activity has begun in the area;
- In areas not actively mined, regeneration of vegetation has begun;
- Extensive construction activity associated with Dam 1 has disrupted Redbank Creek;

- Infrastructure such as roads, buildings and electricity easements are more common; and
- Sheetwash exposures adjacent to Redbank Creek remain visible although less extensive than is seen in the 1963 aerial.

Overlaying the major portion of the Project Area (United Collieries mining lease CCL775) on an aerial taken in 2015 of the landscape now occupied by United Collieries (**Figure 2–4**) displays the following landscape features:

- There has been extensive regeneration of vegetation;
- Redbank Creek now has more vegetation along its banks than any time in the past 50 years;
- There has not been a noticeable increase in mine related infrastructure within the Project Area when compared to the 1987(?) aerial; and
- Exposures are far rarer in the landscape than in previous periods.

**Figure 2-2. The main portion of the Project Area within United Collieries mining lease CCL775 overlain on a 1963 aerial image.**

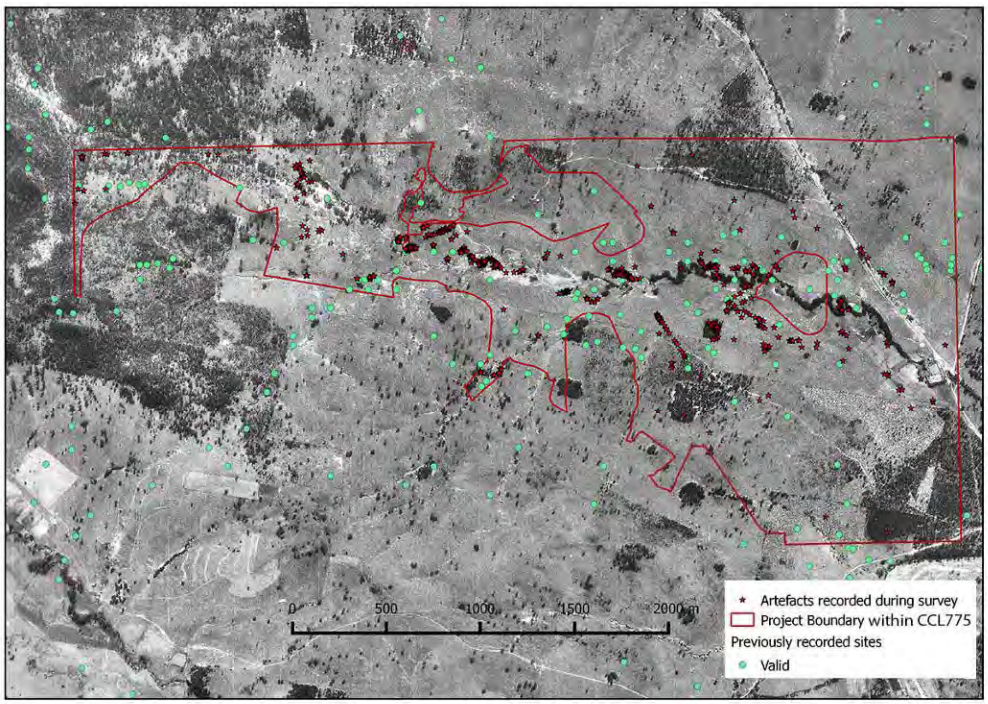


**Figure 2-3. The main portion of the Project Area within United Collieries mining lease CCL775 overlain on a 1987 (approximate) aerial image.**

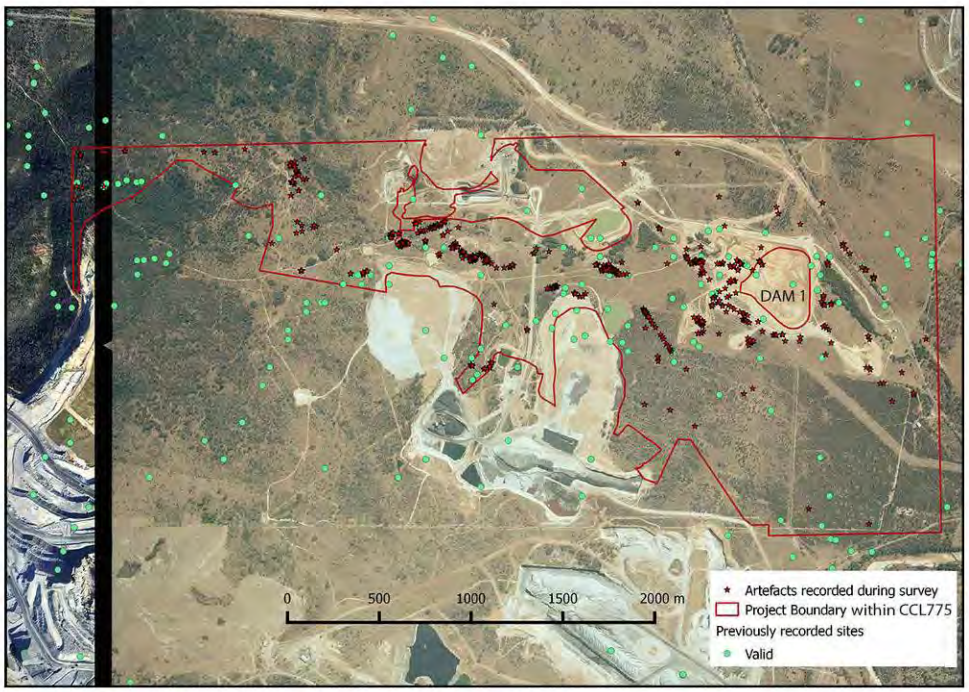
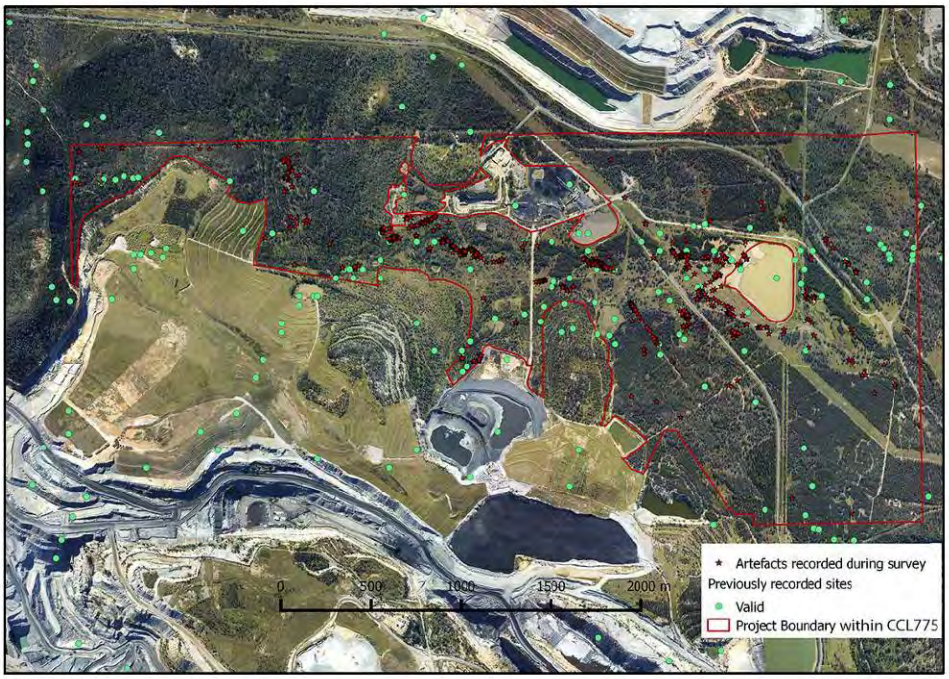



**Figure 2-4. The main portion of the Project Area within United Collieries mining lease CCL775 overlain on a 2015 aerial image.**



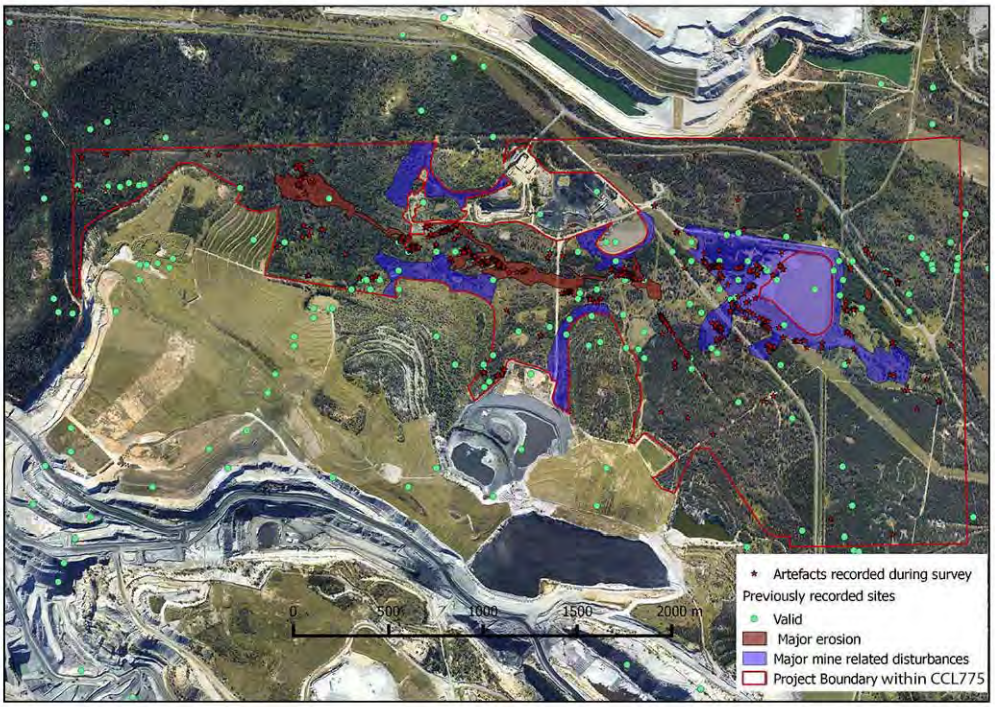
An examination of the 1963 and 1987 aerials enables an evaluation of cumulative disturbances within the main portion of the Project Area within United Collieries mining lease CCL775 that are not visible today due to vegetation regrowth (**Figure 2–5**). These disturbances fall into two broad categories:

- Major erosion disturbances. Largely taken from the 1963 aerial, this area encapsulates the severe sheetwash and gully erosion observed in the 1963 aerial along Redbank Creek. This area includes 17.8ha or 3.2 per cent of the Project Area.
- Major mine related disturbances. Largely taken from the 1987 aerial, this area encapsulates those areas impacted by mine related infrastructure construction such as that associated with Dam 1 and the edges of dumps both from Wambo and United Collieries. This only includes major disturbances as there are other mine-related disturbances outside of these areas such as electricity easements, roads, dams, drilling pads, vents and gas flares. This area includes 78.6ha or 15.8 per cent of the Project Area.

It is informative to note in **Figure 2–5** that the majority of all artefact recordings from the current survey fall within one of these two disturbance areas. This indicates the close correlation between previous disturbance and artefact detection.

For the purposes of this methodology it is accepted that areas within the major mine related disturbance area are likely to have no archaeological integrity remaining due to the nature of the disturbances while areas within the major erosion areas may still contain areas of archaeological integrity.

**Figure 2-5. The main portion of the Project Area within United Collieries mining lease CCL775 with major cumulative disturbances.**




# 3 BACKGROUND TO THE TEST EXCAVATION PROGRAMME

The test excavation programme follows an extensive programme of surface survey across areas that will be potentially impacted by the proposed Project. The Aboriginal heritage surface survey commenced on 23 March 2015 and included 19 days of assessment. The assessment consisted of full pedestrian assessment of potentially impacted areas.

The results of the Aboriginal heritage assessment will be contained in the forthcoming ACHA that will provide full details of all sites recorded.

The results of the current proposed test excavation will also form part of the ACHA and will help inform the mitigation and management options that will be contained in the ACHA.

## 3.1 ARCHAEOLOGICAL CONTEXT

The United Collieries operation area has been subject to extensive Aboriginal archaeological survey and assessment for previous approvals over the last 35 years resulting in the recording of multiple Aboriginal sites.

Based on current information from the Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) database the Project Area contains

104 sites. This total comprises 86 artefact scatters, 15 isolated finds, one Potential Archaeological Deposit (PAD) and two artefact scatters with PAD.

All of these sites are currently listed as valid on the OEH AHIMS database, however, 26 (25 per cent) have been destroyed (or partially destroyed) by permit approved by OEH and nine have had a permit issued but remain valid on AHIMS. Three more sites are located at positions where there has been a high degree of disturbance (one plots to the middle of a dam and two plot to the dam wall of Dam 1) and are likely to be destroyed although OzArk has, to date, yet to locate the reports recording the salvage of these sites. Therefore there remain 75 valid sites within the Project Area[1] (**Figure 3–1**).

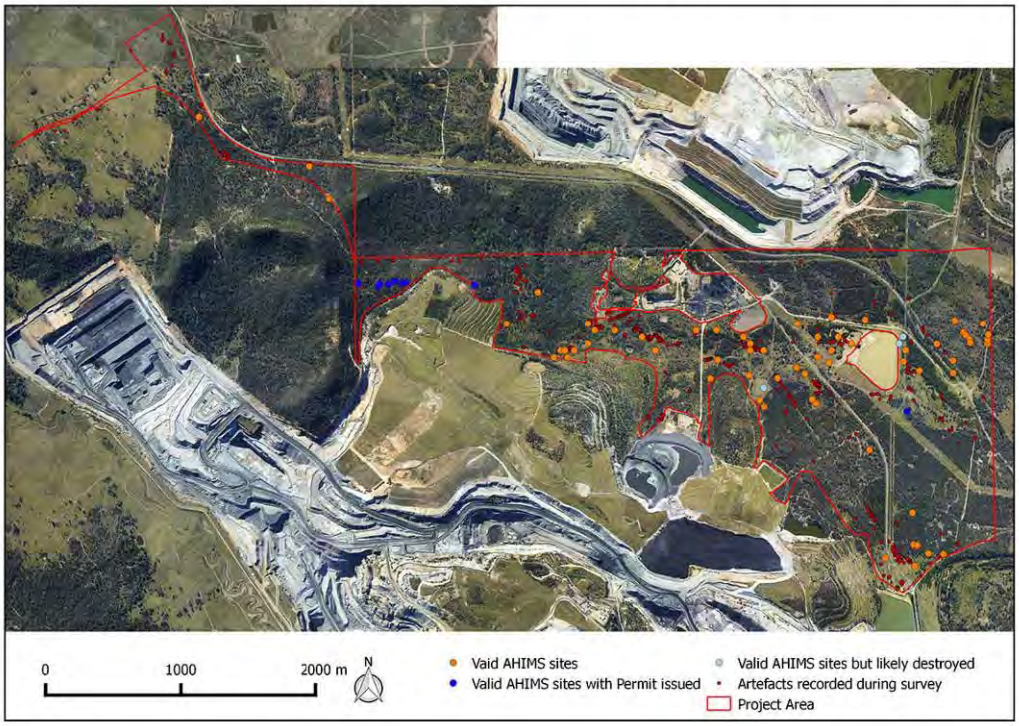
During the course of the survey all 75 valid sites were revisited but the majority recorded that no artefacts are visible today. While this does not mean the sites no longer exist as artefacts may be obscured, it does indicate the following:

- The majority of sites were recorded as long as 35 years ago and it is possible that, in this time, the exact location of sites has been lost (as locational information was sourced from topographic maps rather than more accurate GPS devices) and/or that artefacts have been moved from the recorded location by erosion and water movement;
- The majority of recorded sites were of a low artefact density and it is therefore easier to understand that a low number of artefacts could be obscured whereas larger, more-dense artefact sites would retain a surface manifestation; and
- The high degree of vegetation regrowth noted between 1987 and the present could well obscure artefacts. However, in some cases, wooden stakes had been placed in the centre of the site by the recorders and even at these sites with the surveyors moving leaf litter etc, no artefacts were recorded. This again reinforces how dynamic any landscape is and how difficult it is to re-locate low density sites after a passage of time.

In conclusion therefore, given the results of the survey, the previously recorded sites are largely treated academically in the sense that they indicate where, at some point in time, artefacts were present but not that each dot on the map preserves the location of an actual site. As such, the test excavation methodology will respond more to the current findings of the survey rather than the historic recordings as these recordings may or may not actually be at the location indicated by AHIMS.

[1] OzArk will ensure that all site cards are updated with AHIMS as a part of the current investigation.

**Figure 3-1. The Project Area showing all valid AHIMS sites and the results of the 2015 survey.**




Surveys and assessments that have taken place within the United surface holding area and surrounding areas include those of Dyall (1981), Koettig and Hughes (1983), Hiscock (1984a); HLA (2001); HLA ENSR (2001, 2002, 2007); Umwelt (2002, 2005) and ENSR (2007, 2008). Many of the survey areas have overlapped and as a result of the resurvey of various parts of the Project Area, it has been possible to note a continuous increase in the number of sites, artefacts and features exposed by ongoing erosion and approved mine works.

This information supports the results of the subsurface investigation of sites along Redbank Creek (Koettig and Hughes 1983), which showed that subsurface artefact numbers were greater than those exposed on the surface of the sites being investigated.

Redbank Creek and its tributary system are known to be associated with a large number of previously recorded sites and the most significant sites to date have been recorded along the main channel of Redbank Creek. For example, a study by Hiscock (1993) of a specific stone artefact manufacturing technique used for the production of backed blades (the Redbank A Strategy), was based on studies of artefacts from Redbank Creek. This paper has been influential in the evolution of stone artefact analysis not only in the Hunter Valley, but Australia-wide raising the archaeological profile of the creek line and its sites.

## 3.2 BACKGROUND TO THE TEST EXCAVATION METHODOLOGY

In brief, the Project Area is relatively large and contains areas of varying archaeological potential. In addition, due to the high degree of regrowth, large areas of the Project Area afforded very low ground surface visibility to the extent that it is impossible to know exactly where a test excavation programme (i.e. excavation pits) should be located in order to reveal meaningful information. It is therefore the aim of the test excavation programme to employ two programs to examine the archaeological potential that will be run simultaneously; a test excavation programme and a geoarchaeological auger programme.

The two programs will have the following objectives:

- Geoarchaeological auger programme. Using hand augers a team will investigate areas in the vicinity of Redbank Creek where either the initial assessment is that soil depths are too shallow to preserve archaeological deposits or that ground surface visibility was too low in order to make such an assessment. By sampling such landforms the geoarchaeological auger programme will inform the test excavation programme as to where further investigation may or may not be warranted; and
- Archaeological test excavation programme. In areas, primarily along Redbank Creek, where the survey recorded artefact exposures the test excavation programme will initially be used to investigate the extent and nature of deposits beyond the artefact exposures. A secondary aim of the test excavation programme will be to investigate any locations where the geoarchaeological auger programme indicates that further investigation is warranted.

In this way the test excavation programme will only target those areas displaying higher archaeological potential that have a good probability of containing not only further Aboriginal objects, but intact subsurface archaeological deposits.

The test excavation programme will concentrate along Redbank Creek as the current survey, as well as previous investigations, have shown that landforms on either side of this drainage system have the greatest archaeological potential in the Project Area. However, although once part of the Redbank Creek system, the concentration of artefacts recorded during the survey around Dam 1 will not be investigated further during the test excavation programme. As indicated by **Figure 2–5**, this area has been subject to modification in the past and would not warrant further, subsurface archaeological investigation due to the invasive nature of the past disturbances.

# 4 PROPOSED METHODS

## 4.1 PURPOSE OF THE TEST EXCAVATION PROGRAMME

Although the archaeologically sensitive areas that would be impacted by the Project are within a landscape that has undergone varying degrees of disturbance, there is still a high potential for partially intact features and/or archaeological deposits to exist within the Project's proposed impact footprint.

The purpose of the test excavation programme is to understand more completely the nature of the sub-surface material within the proposed impact footprint to better inform mitigation strategies in terms of the proposed Project impacts. Data obtained from the test excavation programme will inform the mitigation and management options in the forthcoming ACHA.

The aims are therefore to:

1. Establish the extent and nature the of sub-surface archaeological deposits within the Project's proposed impact footprint;
2. Use the data gained from the test excavation programme to better evaluate the archaeological significance and potential of the area; and
3. Develop, in consultation with the RAPs, an informed management strategy for the Project impact footprint to assist in mitigating the proposed impacts.

Excavations undertaken as per the Code do not require an Aboriginal Heritage Impact Permit (AHIP) under the NPW Act.

## 4.2 PREDICTIVE MODEL

In Section 3.2 of the United Open Cut Project Archaeological Survey Methodology, a predictive model for site location was set out. As set out in **Section 2** of this document, the results of the survey largely confirmed the predictive model set out in the survey methodology in that the majority of sites were recorded in close association to water and that sites away from water tend to have a lower artefact density. As such, the predictive model as set out in the survey methodology is used again to determine the best locations for the test excavation program. While it is accepted that this model is 'predictive' and not exclusive, it is felt that strategies will be employed during the test excavation program, such as deploying the auger program in areas such as flat ridge topography either side of the Redbank Creek, that will further test the veracity of the model.

## 4.3 SAMPLING STRATEGY

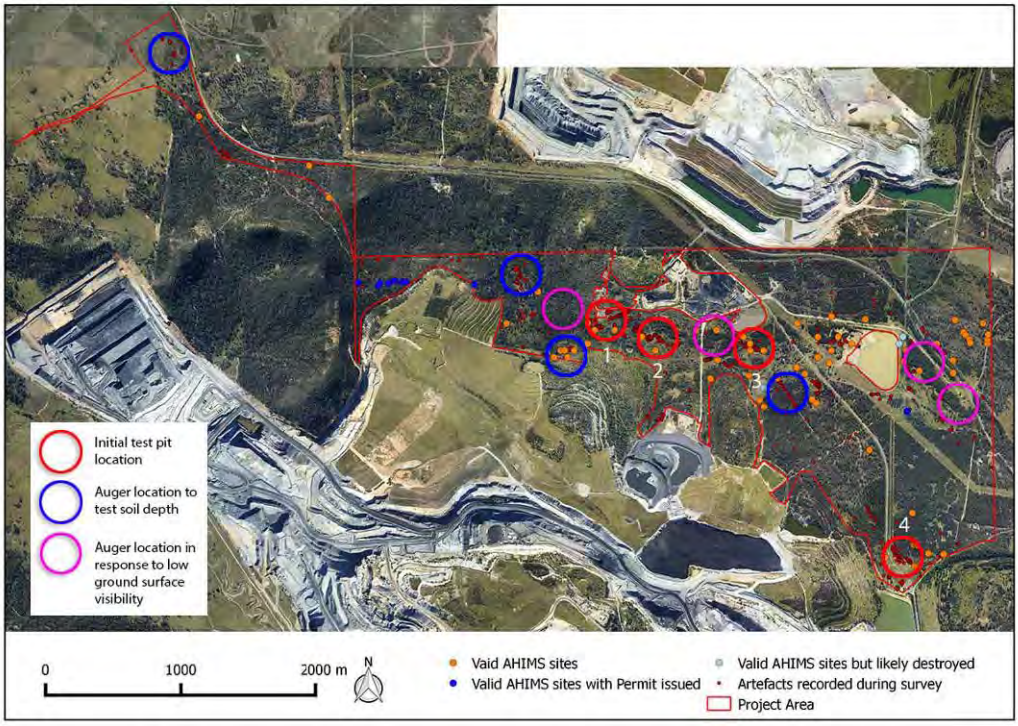
The test excavation programme sampling strategy[2] will be governed by three criteria:

1. Initial test excavation programme: At these locations the test excavation programme will investigate the extent and nature of archaeological deposits adjacent to known artefact scatters;
2. Auger locations to test soil depth: The initial phase of the auger programme will be to investigate three areas where there are known artefact scatters but where the initial analysis is that soil depths are too shallow to preserve archaeological deposits and thereby making test excavation unwarranted. However, to test the survey analysis, a hand auger programme will take place at these locations to determine if further test excavation is warranted; and
3. Auger locations where ground surface visibility is low: Following the completion of criterion 2 above, the auger programme will investigate other areas along Redbank Creek where ground surface visibility was low and there are no known artefact scatters. Should the auger programme in these areas indicate that test excavation would be warranted then test excavation would take place at these locations to determine the presence or absence of archaeological deposits.

The proposed location of these activities is shown in **Figure 4–1**. As noted above, no testing will take place surrounding Dam 1 as there has been a high degree of previous disturbance in this area that would make test excavation unwarranted.

[2] OzArk would like to acknowledge and thank the input of Jakub Czastka into the strategy and design of the auguring program as part of this methodology.

**Figure 4-1. The Project Area showing the location of areas to be investigated during the test excavation programme.**




In detail, the following observations can be made.

### 4.3.1 Initial Test Pit Location

Area 1: This area has a moderate degree of disturbance from drainage works and the majority of the artefacts were recorded along raised bunds. The aim of the test excavation in this area will be to determine if there are intact archaeological deposits in areas less-disturbed by the earthworks.

Area 2: This area is an extensive series of exposures on the southern bank of Redbank Creek. The aim of the test excavation in this area will be to investigate the nature and extent of deposits adjacent to the visible artefact exposures.

Area 3: Like Area 2, Area 3 is an extensive series of exposures on the southern bank of Redbank Creek. The aim of the test excavation in this area will be to investigate the nature and extent of deposits adjacent to the visible artefact exposures.

Area 4: An extensive artefact exposure was recorded along a minor drainage line in the Wambo lease area. Soil profiles adjacent to the exposures appear intact. The aim of the test excavation in this area will be to investigate the nature and extent of deposits adjacent to the visible artefact exposures.

#### *4.3.1.1 Sampling strategy*

The sampling strategy in the four areas designated for initial test excavation (marked in red in **Figure 4–1**), as well as any test pitting that may follow from the results of the auger programme, will take the form of first excavating 0.5m x 0.5m excavation squares at 10m intervals to create a linear transect of 50m (called here the 'initial transect'). These transects will be placed directly adjacent to known concentrations of artefacts (i.e. out of erosion areas) that have been identified in during the survey or through the geoarchaeological auger programme.

If the final pit of the initial transect records reasonable numbers of artefacts (i.e. more than 15 – equivalent to 60 artefacts per $m^2$) the initial transect should be expanded linearly, in 10m intervals, until such time as it is clear that the site boundary has been passed (i.e. test excavation pits that are recording no artefacts or very low artefact densities of less than five artefacts per pit), the extent of potential impact has been reached or the transect has been expanded to a maximum linear distance of 100m.

If, along the initial transect, reasonable numbers of artefacts (i.e. more than 15 – equivalent to 60 artefacts per square metre[3]) or archaeological features are encountered, then a further transect (also at 10m intervals) will be placed at right angles to the pit containing the artefacts/features so that it runs away from the watercourse (or across a particular landform). An archaeological feature could be such things as a hearth or an unusually high concentration of artefacts. This transect would continue until it is clear the site boundary has been passed. Along any one initial transect these perpendicular transects would be limited to a maximum of two.

Thus, at any one location a minimum of six pits shall be excavated and it is envisioned that at most locations, allowing for perpendicular expansion, that up to 11 pits would be excavated to give a testing area of 50m x 50m (i.e. 6 pits along the initial transect = 50m plus five pits perpendicular to the transect = 50m).

Should notable concentrations of artefacts (i.e. in excess of 60 artefacts per square metre) and/or archaeological features such as hearths be encountered in any pit along any transect, the methodology allows for additional 0.5m x 0.5m pits to be placed immediately adjacent to the pit containing the artefacts/feature to allow a full examination of the feature (up to the maximum of $3m^2$ allowed under the Code).

In this way transects will not only investigate the distribution of artefacts along a watercourse or landform feature, but also the distribution away from the watercourse (or across a landform feature) to determine site boundaries.

[3] For the purposes of this investigation an artefact is defined as having dimensions greater than 15mm.

### 4.3.2 Auger programme to investigate soil depth adjacent to known artefact scatters

At three locations (marked in blue in **Figure 4–1**) artefacts were recorded during the survey but were located in areas where a shallow soil depth is assumed. To test this conclusion, a hand-auger programme will be deployed in order to confirm or refute the initial analysis of shallow soil depth. Should the auger programme reveal soil depths that may contain archaeological deposits in these areas then, following the completion of Areas 1–4 outlined in **Section 4.2.1**, the test excavation programme would move to these locations and carry out test excavation using the same sampling strategy as outlined in **Section 4.2.1.1**.

#### *4.3.2.1 Sampling strategy*

The aim of the auger programme is to identify any more-recent overburden and the depth of the A1 and A2 soil horizons in relation to the B soil horizon. The auger programme will identify the horizontal extent of potential archaeological deposits and investigate whether a landform contains features such as palaeochannels, buried soils and/or palaeosols. The nature of the auger programme is that an extensive landform can be tested relatively quickly.

For those auger test areas adjacent to an incised creek line, exposed sections within the channel should be cleaned up, photographed and described. This will provide the 'baseline data' for the auger program.

The auger programme will hand-auger boreholes on a 10m grid and record soil texture, soil colour (recorded moist using the Munsell colour system), soil pH and soil inclusions from each borehole. Should the data from each borehole indicate no soil change from the previous borehole, then the auger team may decide to only fully record anomalous boreholes. This information will be recorded using pre-prepared recording forms.

Recording values such as pH are useful for spotting different soils if, for example, the normal spread of deposits is neutral or slightly acidic, any high alkaline values may provide clues to soils formed under different climatic conditions: usually drier conditions. Texture analysis is useful for providing clues to depositional environments. For example, material in the upper part of the catchment for Redbank Creek is quite stony between the base of the A2 and B horizons. Texture of the deposits will vary as one moves downstream and away from the channels.

An auger survey is an extremely fast, efficient way of generating 3D mud-maps of a landscape and will provide the investigation with solid data to target the deepest, most intact sequences that may contain archaeological deposits.

Further, the auger program should include areas of the flat ridge topography either side of the Redbank Creek, as well as areas where subsoil horizons are exposed (which means that overburden and top soils do not need to be excavated or removed prior to testing). This will

determine the depth and nature of the B Horizon soils at United and explore whether Pleistocene deposits may be present.

A representative and labelled sample of soil from selected auger holes at each location should be retained for further study should it be required.

Should soil sequences be identified that have archaeological potential, then the auger programme will be followed by a test excavation programme as outlined in **Section 4.2.1**.

### 4.3.3 Auger programme to investigate areas of low ground surface visibility

At several locations along Redbank Creek the vegetation was so thick that it was impossible to see the ground surface and to accurately evaluate the archaeological potential of particular areas. In the four areas marked in pink in **Figure 4–1** the auger program will help determine if test excavation in these areas is warranted. The auger programme in these areas should follow the completion of the auger programme outlined in **Section 4.2.2**. The auger programme would follow the same sampling and recording methodology as is set out in **Section 4.2.2.1**.

Should the auger programme in these areas reveal soils and/or soil depth indicating that test excavation is warranted, then test excavation would take place in those areas following the methodology set out in **Section 4.2.1**.

## 4.4 SAMPLING STRATEGY COMPLIANCE WITH THE CODE: REQUIREMENT 16

1 Test excavation units must be placed on a systematic grid appropriate to the scale of the area—either PAD or site—being investigated e.g. 10m intervals, 20m intervals, or other justifiable and regular spacing.

- The sampling strategy outlined above complies with this requirement.

2 Any test excavation point must be separated by at least 5m.

- The sampling strategy outlined above complies with this requirement. It should be noted that while the initial transects will have 10m intervals that the Code allows expansion around pits displaying notable concentrations of artefacts (i.e. more than 60 artefacts per square metre) or archaeological features. These 'expansions' are limited to a maximum area of $3m^2$.

3 Test excavations units must be excavated using hand tools only.

- The sampling strategy outlined above complies with this requirement.

4 Test excavations must be excavated in 0.5m x 0.5m units.

- The sampling strategy outlined above complies with this requirement.

5 Test excavations units may be combined and excavated as necessary to understand the site characteristics, however:

i) the maximum continuous surface area of a combination of test excavation units at any single excavation point conducted in accordance with point 1 (above) must be no greater than $3m^2$;

- The sampling strategy outlined above complies with this requirement.

ii) the maximum surface area of all test excavation units must be no greater than 0.5% of the area—either PAD or site—being investigated.

- The number and size of test excavations undertaken as part of this programme will be managed to ensure that this requirements is satisfied.

6 Where the 0.5m x 0.5m excavation unit is greater than 0.5% of the area then point 5 (ii) (above) does not apply.

- Not applicable. As all potential archaeological deposits are spatially large, less than 0.5% of the known potential archaeological deposits dimensions will be investigated.

7 The first excavation unit must be excavated and documented in 5cm spits at each area —either PAD or site—being investigated. Based on the evidence of the first excavation unit, 10cm spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.

- Complies. See **Section 5** point 5.

8 All material excavated from the test excavation units must be sieved using a 5mm aperture wire-mesh sieve.

- Complies. See **Section 5** point 6.

9 Test excavation units must be excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile.

- This requirement will be fulfilled in the field and all excavation squares will be excavated to the basal clays. To ensure that, as suspected, these basal clays are culturally sterile, several deeper probes in each excavation area will be excavated into these clays to ensure that they are, in fact, culturally sterile.

11 Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects must be made for each single excavation point.

- Complies. See **Section 5** points 8, 9, 12, 13 and 14.

12 Test excavations units must be backfilled as soon as practicable.

- Complies. See **Section 5** point 7.

13 Following test excavation, an Aboriginal Site Impact Recording form must be completed and submitted to the AHIMS Registrar as soon as practicable, for each AHIMS site that has been the subject of test excavation in accordance with the requirements of the Code.

- It will be the responsibility of OzArk to ensure that this requirement is met.

# 5 PERSONNEL AND METHODS

The excavation programme will be undertaken by archaeologists and representatives of RAPs and will include the following aspects:

1. Four areas will be initially investigated by the test excavation programme. Further areas may well be investigated should the results of the geoarchaeological auger program indicate that test excavation is warranted. Further test excavation will be confined to the areas indicated for the auger programme in **Figure 4–1**.
2. Locations for the proposed initial test excavation programme are provided in **Figure 4–1**.
3. Prior to any excavation, the site will be recorded via digital photography.
4. A minimum of six 0.5m x 0.5m excavation units will be excavated at each location although the methodology allows for additional units to be excavated within each area should the results indicate that this is warranted. These will be positioned so as a valid sample of the impact areas is obtained so that the archaeological values of each area can be characterised.
5. Initial excavation squares will be excavated in 5cm spits to determine whether archaeological stratigraphy is present. If not, spit size will be increased to 10cm. If archaeological stratigraphy is present, this will be used rather than spits.
6. The excavated material from all pits will be sieved on site using dry sieving through nested sieves of 6–8mm and 2.5–3.5mm mesh (which is considered to satisfy the 5mm aperture wire-mesh sieve requirement).
7. Each excavator (by hand) will be responsible for sieving the deposit from their pit, retrieving the artefacts and, in conjunction with the supervising archaeologist, correctly recording their provenance. There could be some room for assistance with the sieving but a self-contained approach is preferable. Deposits will be sieved on to tarpaulins and the spoil used to backfill the pit.
8. A standard excavation recording form will be used for each excavated pit. Details will include; date, site recorder, spit number and depth, description of finds, description of soil, sketch plan of excavation (if relevant to show structure), end of spit levels, soil pH (when necessary or appropriate) and a bucket tally.
9. It is envisioned that the excavation crew will consist of two archaeologists; one assistant archaeologist, one operations manager and eight cultural heritage field workers. The operations manager would operate with a 4WD vehicle and move between excavation teams, attending to problems, fixing equipment, backfilling positions if needed etc. The excavator of each pit, in conjunction with the supervising archaeologist, will be

responsible for ensuring any forms are correctly completed. It will be the site archaeologist's responsibility to perform all photographic tasks, undertake any planning and section drawing if required and to ensure that a correct location of each pit is maintained.

10. Given that the work will be reasonably physical, all persons participating on the test excavation programme should be aware of this and be 'fit for work'.

11. If intact archaeological deposits or archaeological features are encountered, then additional archaeological pits may be excavated to ensure documentation of any features and/or retrieval of artefacts and other relevant archaeological material. A feature would include a high density of artefacts within a square, or a square containing rare or unusual artefacts (such as artefacts constructed from a stone type rarely represented in the area or less-common tool forms such as ground edge axes, hammerstones etc), or other signs of human occupation i.e. ground ovens/hearths or charcoal concentrations.

12. If appropriate (i.e. intact archaeological stratigraphy is recorded) section drawings will be completed for appropriate pits. If no archaeological stratigraphy is recorded then digital photographs shall be taken of a representative section of each pit and a suitably representative drawing made of the pit section to show the soil profile.

13. Analysis of all excavated lithics will be made in order to determine the site's characteristics and to enable the site to be compared with other sites in the region. Analysis will also assist in determining what type of activities the Aboriginal people carried out at the site and their relationship with local resources (fauna, flora, water and stone). All artefacts will be analysed and selectively photographed. If charcoal from a secure context is obtained, it may be sent to a laboratory for C14 dating (subject to proponent's agreement.

14. Select faunal remains, if recovered, will be analysed by a fauna specialist. Remnant shell and bone fragments may assist in determining what foods Aboriginal people may have eaten at the specific site and may elucidate possible foraging strategies. In conjunction with *in situ* stone tools, bone/shell fragments may also provide evidence of specific usage of stone tools for food processing.

15. Artefacts will remain in the care of OzArk until such time as the analysis is complete. Every effort will be made to analyse artefacts on-site to ensure that the artefacts do not have to leave United Colliery. However, in the case of large artefact numbers or artefacts requiring further research, it may be necessary to take artefacts off-site. If taken off-site, the artefacts would be the responsibility of OzArk and every effort would be made to return all artefacts to United Colliery as quickly as is possible. At the completion of analysis (whether on-site or off-site) artefacts will be returned to Glencore United

Collieries offices where whey will be kept in a locked location until point 17 below is enacted.

16. The results of the test excavation programme will inform the forthcoming ACHA. Excavation results will be used to advise further courses of action in relation to the management and mitigation options for the Project.

17. Once all salvage activities for this Project are complete, artefacts will be amalgamated and their ultimate fate will be subject to agreement between the RAPs and OEH.

### 11.3.15 Feedback from Tocumwal - 10 February 2016

Tocomwall

Sean Piggot
Approvals Coordinator
Glencore Coal Assets Australia
Via email: Sean.Pigott@glencore.com.au

10 February 2016

Dear Sean,

**Re: Review of Aboriginal Archaeological Values Assessment: United Wambo Project, December 2015. Ozark.**

The following document is an archaeological review of the aforementioned Ozark draft report. This review is purely a scientific one regarding the methods, techniques, and results by Ozark. The cultural values for the Plains Clan of the Wonnarua People (PCWP) are covered in a separate report '*Glencore United Collieries Aboriginal Cultural Heritage Assessment* (Tocomwall 21 October 2015).'

The following review will refer to a number of documents that are referenced throughout this review, including previous submissions by Tocomwall on the survey and test excavations by Ozark.

The review is by no means exhaustive. As is demonstrated in the following document, the shortcomings of the testing program precludes a more detailed review simply because the scientific validity of the report is questionable. Therefore, no attempt is made to comment on the significance assessment or the management recommendations since Tocomwall consider the evidence that they are based on, and the conclusions drawn, cannot be justified based on the methods and assumptions used to reach them. Until such a time that these flaws are addressed adequately, Tocomwall will not and cannot support the report from either a cultural or scientific perspective.

**Background**

Throughout the course of the project lifecycle, Tocomwall have sought to provide both scientific and cultural input into the nature of the proposed survey and test excavation program with a view to stating the PCWP's position in regards to the proposed archaeological program. This has included suggestions on fieldwork techniques, theoretical considerations of appropriate hunter-gatherer ethnographic analogy and relevant archaeological models, as well as geoarchaeological considerations.

Tocomwall have restricted their comments to the following subjects:

1. The landscape context;
2. The fieldwork;
3. Predictive Modelling; and
4. Results.

Tocomwall have not responded to the significance assessment or the management recommendations because we consider the report to lack scientific rigour and based on our conclusions, we do not believe that the management recommendations are based on a sound analysis of the available information. Tocomwall therefore reject the significance assessment and management recommendations and will continue to do so until an appropriate report is tabled.

**The Landscape Context**

Firstly, there is absolutely no geomorphic analysis in which to place the soil landscape data in order – for example - to develop a soil chronosequence for the study area. This is a very significant drawback of the report and means that there is absolutely no understanding of stratigraphy: chronological controls that should have been informed by the identification of and/or consideration of the nature of time-transgressive sequences and whether they illustrate historical overlap or not are simply not considered. This is a significant flaw and essentially means that test pit locations may reflect vastly different chronological settings. The absence of this 'stratigraphical information' means that layers have, for all intensive purposes, been mixed. This being the case, it calls into question any and all conclusions about the nature, distribution and significance of archaeological deposits.

This is particularly antagonistic after the considerable effort made by Tocomwall (October 2015) in their cultural values assessment to highlight the importance of geomorphology to the understanding of prehistoric hunter-gatherer archaeology (see also Tocomwall 10 June 2015; 8 July 2015). Furthermore, the importance of geoarchaeology to Aboriginal archaeology is outlined in substantial detail within this report (October 2015: Chapter 4*)*: Tocomwall will not repeat the details here and refer Ozark to this chapter. Of particular concern to Tocomwall is the fact that we were assured by a previous employee of Glencore (*pers.com May 2015* Mathew Goddard, Glencore: *ibid: 34*) that '*the geomorphology of the study area is well know* (*ibid*).' Clearly, Tocomwall have been mislead in regards to the understanding (or lack thereof) of the geomorphology.

Tocomwall therefore insist that this is rectified as soon as possible before a final draft report is tabled for a review. This should include detailed cross sections of the stratigraphy across the study area and how they relate to the testing program and location of test trenches. Indicative examples of cross sections were provided in the Tocomwall report: e.g. Figures 4-6 (pages 37, 39 and 40 respectively). The final draft report by Ozark should include information to at least this standard.

The short-comings in the analysis of the landscape is further evidenced by the assessment of soils (Ozark December 2015: 15). The generalisation quoted from Koettig and Hughes (1983) is exactly that, a generalisation. For example, the presence of gravels[1] (and larger clasts) is largely confined to areas away from floodplains and associated with elevated (in places rugged) topography (Plates 1 and 2). These 'headwaters' are located in steeper terrain where colluvial processes have influenced the particle size distributions of the soil profiles. Conversely, where gravels are located on floodplain topography (Plate 3) they represent channel migration as well as changes in hydrological regimes associated with increased run-off (as a result of 'wetter' conditions? Or reductions in the type and density of vegetation cover?). The morphology of the gravels is in itself an indicator of colluvial verses fluvial depositional environments: compare for example the unsorted nature of the gravels in Plate 1 with the sub-rounded to rounded gravels in Plate 3.

Crucially, no attempt has been made during the course of the testing program to test Pleistocene aged deposits despite the fact that the B horizons are sodic soils and therefore highly susceptible to dispersal in water due to deflocculation (see for example ERM 2004 for a discussion on sampling

[1] The term 'gravel' is used in its generic context rather than as a clast size unless otherwise indicated.

Holocene and Pleistocene soils). The nature and distribution of the soils within the study area make it an ideal laboratory for testing whether Pleistocene aged archaeology is present. Unfortunately, this was not considered in the testing program. As such, Tocomwall cannot support the current analysis of the landscape assessment of the study area.

Plate 1: East view of soil profile from the headwaters of Redbank Creek. Note the inclusion of unsorted gravels through to pebble-sized clasts: contrast this image with Plate 2 in relation to the absence/presence of coarser (i.e. > coarse sand) clasts. Plate 2 is located in a different (lower) topographical setting. Scale is 1.5m.

Plate 2: North view of a remnant soil profile indicating an $A_1$ (>0.30m thick) overlying an $A_2$ and B horizon. Clearly the $A_1$ topsoil (dark grey uppermost layer) is relatively intact. For a soil profile like this, the expectation would be to sample both A horizons (probably Holocene in age) as well as the B horizon (probably Pleistocene in age). The fact that the soils across the study area are sodic means

that they are highly dispersive when subjected to water, i.e. wet sieving would be incredibly effective in breaking down the subsoil to reveal artefacts. Scale is 1.5m.

Plate 3: Northeast view of imbricated river gravels illustrating episodic fining upward sequences. These gravels represent river channel migration as well as changes in fluvial depositional environments. Scale is 0.2m.

**The Fieldwork**

*Identification of Site Boundaries*

Before moving on to a consideration of the fieldwork methodology, a brief review of how 'sites' have been demarcated is presented. Firstly, we shall consider the Ozark site definitions for open sites and isolated finds. Ozark defines open sites as '*either two or more artefacts in a discrete area. The term is also applied to diffuse open sites that consist of a number of seemingly not associated ~~not~~ [my editing] artefacts within a landform unit; and Isolated Finds: is an artefact without any other associated artefacts in the vicinity* (Ozark December 2015: 60).' No definition is provided for what constitutes a 'discrete area,' how artefacts 'seemingly not associated...within a landform unit' may relate to one another, or what is meant by (in spatial terms) 'without any other associated artefacts.' Some clear definitions of what these parameters are would have provided some validity to these loose and unhelpful definitions. Furthermore, reference to some ethnographic studies and examples of hunter-gatherer sites (e.g. Binford 1980; Foley 1981; Lourandos 1977 etc) would have certainly helped define what a 'discrete scatter' verses what constitutes an 'isolated find.'

A representative example is Site United OS-1, a discrete (defined here as less than 10m apart) series of several artefact concentrations located on a lower slope landform. From a spatial and geomorphic perspective, the location of the site boundary is arbitrary: there is no logic to the grouping of these discrete artefact locations with one another in either time or space. The site boundary cannot therefore be supported: it looks like these artefacts have been grouped together – not because they represent a site – but because of expediency. That is, it's easier to deal with larger 'site boundary's' and less sites than to be more accurate and call these sites separate 'events.' Furthermore, Site

United OS-1 is not an archaeological site in the archaeological meaning of the term. Rather, it is a series of lag gravels resulting from the erosion of deposits observed as a surface expression of possibly (probably?) unrelated artefacts, i.e. the spatial association is a function of geomorphic processes rather than human behaviour. The interpretation of these artefacts as a site would have been archaeologically meaningful had some form of association been proven: for example some of the artefacts could be refitted or they were located within a discrete landform element. This is clearly not the case for this site. Unfortunately, the same applies to all of the remaining 24 'open sites' identified across the study area, with extreme examples of incredibly tentative 'associations' such as United OS-4, United OS-5, United OS-10 etc. Clearly, locating a series of artefacts that reflect geomorphic rather than anthropogenic processes and have no obvious spatial, temporal or behavioural attributes that can be linked has resulted in a series of 'site' groupings that cannot be substantiated from an archaeological perspective. Therefore, Tocomwall would like to see some supporting evidence on how these 'sites' have been identified or alternatively, the 'sites' need to be reassessed in relation to their intra- and inter-site characteristics.

*Fieldwork*

The discussion on the fieldwork is confined to some minor comments on what has been updated in the current review from the Ozark test excavation methodology presented in June 2015 (see Tocomwall 8 July 2015 for detailed comments and concerns with the test excavation methodology). Tocomwall disagrees with Ozarks assessment of the review of the methodology that "*many of the comments were beyond the capabilities of a test excavation program and were better suited to a major salvage program* (Ozark December 2015: 178)." Most of the issues identified in the current review are a direct result due to the absence of a predictive model (see below), no geomorphological interpretation and problems with site 'associations' that could have been avoided if more of the comments and suggestions had been acted upon. In particular, analysis of soil geomorphological data would have benefited from the concerns identified in the Tocomwall review (8 July 2015): currently there is an absence of contextual data since the geomorphology has not been considered.

The misuse of the term 'geotechnical' (Ozark December 2015: 179) does not inspire confidence in Ozark's ability to understand the landscape context. For future reference – and as noted previously by Tocomwall (8 July 2015: 1) - 'geotechnical' investigations are undertaken in order to understand the engineering properties of soils, sediments and bedrock. Tocomwall hopes that the auger program undertaken by Ozark was from a geoarchaeological perspective: however, the lack of geomorphological mapping or interpretation within the study area suggests that is not the case. Furthermore, Ozark note that "*The test excavation program was concentrated along Redbank Creek*...(Ozark December 2015: 179)." With respect to testing an archaeological model (see below for more detail), the expectation is that testing should occur both in areas where one predicts archaeology to be extant, **as well as in areas where one does not predict archaeological sites to be present**. This was not undertaken: i.e. only areas where archaeology was predicted were tested. This is an unscientific approach and leaves the current 'testing' program as little more than an exercise in pursuing 'expected site distributions' and ultimately presenting a 'self fulfilling prophecy' rather than a scientifically meaningful sampling strategy.

**Predictive Modelling**

The statement "*The postulation of a predictive model for the Project Area is almost superfluous given the intensive and long running investigations that have taken place over the past 30 years* (Ozark December 2015: 52)" is, by-and-large, indicative of the poor level of scholarship applied to the current study. Furthermore, it is dismissive of the previous investigations undertaken across the study area and is, quite frankly, offensive to the members of the PCWP (see also Tocomwall 8 July 2015 for a more detailed discussion on predictive modelling). Considering that fieldwork and associated reporting has been undertaken across the study area since 1980, the following conclusions reached in the Tocomwall study are poignant, particularly in respect to the comment quoted by Ozark in the opening sentence of this section, namely (Tocomwall. October 2015: 56-57):

> *'Our understanding of the prehistory of the Hunter Valley is still very limited: studies conducted over the last 30 years or so have focused on a very basic predictive model and more importantly, this model has rarely been tested in regard to its veracity. As a result our knowledge of Aboriginal settlement patterns of the region is largely based on the distribution of artefacts in association with erosional features. In effect, our understanding of prehistoric activities such as subsistence, migration and mobility, differential use of landscapes (seasonal, functional, cultural etc), trade etc is still rudimentary. There has been no development or advancement of theories from the early studies undertaken in the Hunter Valley. Instead, reports tend to concentrate on simple observations without a theoretical basis, lack a chronological framework and do not question the nature of artefact distribution, e.g. the bias of sites associated with erosional factors. The models largely centre on the proximity of watercourses and assume these provided everything needed (water, food, raw materials). They ignore the fact that they are founded on observations in a modern landscape that has been considerably altered since the introduction of European land management practices. For example, many modern-day creeks have become entrenched and were actually chains of ponds at the time of contact.*
>
> *The current predictive 'model' is also uncritical in relation to the bias of artefact concentrations within alluvial landforms subject to continuous depositional and erosional processes. Questions that relate to whether the contexts are modern alluvium or are buried beneath modern alluvium and whether deposits reflect stratification and/or chronological changes (for example, soil chronosequences) are rarely considered. The veracity of the model has suffered because of the lack of scientific rigour: most excavation programs are centred on landforms where artefacts are predicted (e.g. alluvial settings); testing this expectation by excavating in landforms where artefacts are not predicted is rarely undertaken. The absence of scientific approaches to testing predictive models has resulted in Aboriginal settlement patterns becoming skewed to reflect our expectations, rather than testing those expectations. Unfortunately, this has become accepted archaeological practice and ultimately means that our perceptions are biased towards a narrow range of hunter-gatherer activities centred near waterways (ignoring for example springs) and potentially within reworked and relatively modern depositional environments.'*

The above two paragraphs were written before the completion of the Ozark report. One point that needs to be emphasised here is that the whole purpose of archaeological models is to continually confirm and/or refine them in order to develop our understanding of Aboriginal settlement and subsistence patterns – i.e. to test the veracity of current models and build upon them. The only other point to add is that the Ozark report has contributed **no new data in regard to predictive modelling** or our understanding of Aboriginal lifeways in the Hunter Region and specifically in relation to Redbank Creek. This is a serious failure in the reporting by Ozark, particularly since they did not test the previous models and conclusions postulated by various authors within their own fieldwork, e.g. no testing was undertaken in areas where the expectation was that no archaeological deposits would be located. Furthermore, the 'sampling' strategy failed to include a Pleistocene testing component. In light of this, Tocomwall strongly objects to the lack of scientific rigour apparent in the Ozark report with regard to predictive modelling. In many respects a predictive model is the cornerstone of any archaeological testing program: its absence in the Ozark report and equally importantly, the failure to take into account Tocomwall's concerns regarding the paucity of modelling, is again a serious misjudgement and error on Ozark's part to take the study seriously. Once again, until Ozark have rectified this serious flaw within their study, Tocomwall do not and will not support the report as it is currently presented.

**Results**

The presentation of the results by Ozark and in particular their surprise at the relatively 'low density' of artefacts can be explained in a number of ways, particularly by reference to archaeological models such as Foley's (1981) 'off-site' archaeological model, as well as geomorphological processes.

Firstly, the distribution of the surface artefact lag gravels provides a clue as to the expected distribution and density of stone artefacts. This should however be qualified by the statement that the extensive erosion of topsoils across the study area means that one has an excellent overview of the distribution of archaeology in areas where surface visibility is sufficiently clear. That is, the available 'window' to observe surface artefact densities is far greater than could be generated by test excavation. The surface sites recorded by Ozark are usually in the order of several hundred square metres – as defined by their arbitrary boundaries – and rarely consist of more than 20 artefacts. This being the case, we are looking at artefact densities of 1 artefact per tens of square metres in most cases: it is unrealistic therefore to expect the deposits that were tested to contain densities of a higher magnitude. The parameters that warranted further investigation – 15 artefacts per 0.5m x 0.5m test pits – are, when compared to the surface densities, unrealistic.

Secondly, comparison with archaeological models such as that by Foley (*ibid*) clearly demonstrate that the expected distribution (e.g. Tocomwall October 2015: Figure 7: 50) of artefact densities across a landscape is a product of the nature of the type of 'settlement' or 'activity' performed (refer also for example to Binford 1980; Lourandos 1977). One can interpret the background scatters as possibly representing short-term 'one-off' events such as foraging or butchering for example, i.e. peripheral activities. On the other hand artefact distributions that reflect higher densities may be associated with base camps and reflect activities that were 'long-term', particularly in comparison with the peripheral activities. Whilst very much a generalisation reflecting two simple (and limited) interpretations of the material record, it serves as a useful 'yardstick' to compare and contrast

potential explanations for the distribution of material culture across a landscape. Furthermore, if we consider the fact that there is a high probability that Redbank Creek was a series of waterholes rather than a continuous creekline with access to open water – at various times in the pre-Contact past – then we have another possibility for the uneven distribution of artefacts, namely clustering around waterholes.

The conclusions reached therefore at the end of the results section are open to a great deal of criticism. The lack of any formal geomorphological framework, the limited testing, the arbitrary site boundaries, the lack of a scientifically rigorous sampling program and the absence of a genuine predictive model serves to render the report archaeologically unreliable and highly suspect. The report is in essence a series of unsupported statements based on a limited understanding of landscapes and hunter-gatherer settlement patterns.

**Concluding Remarks**

Overall, Tocomwall is extremely disappointed with the Ozark report and in particular the lack of scientific veracity. Furthermore, this is despite the continuous dialogue that Tocomwall have presented during the project lifecycle in regards to geoarchaeology, ethnographic analogy and archaeological modelling. Tocomwall would be happy to meet with Ozark representatives in order to provide a context for progressing and quite frankly, re-writing the current report. As the report stands, Tocomwall cannot and do not support the interpretative framework and therefore cannot support the results, conclusions, significance assessment or management recommendations.

As was clearly demonstrated in the recent NSW Land and Environment Case - Darkinjung Local Aboriginal Land Council v Minister for Planning and Infrastructure & Anor; Australian Walkabout Wildlife Park Pty Limited (ACN 115 219 791) at Trustee for the Gerald and Catherine Barnard Family Trust v Minister for Planning and Infrastructure & Anor – there are serious issues with the way that archaeology is being practiced in NSW. Tocomwall would respectfully refer Ozark to the findings and conclusions of this NSW Land and Environment Case in relation to Aboriginal archaeology.

Please feel free to call me should you wish to discuss the review further.

Regards,

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