

appendix 12
Part 1

**Aboriginal Archaeology
Assessment (Main Text)**

Oceanic Coal Australia Limited

**Aboriginal Cultural Heritage and
Archaeological Assessment
West Wallsend Colliery
Continued Operations Project**

July 2010

Aboriginal Cultural Heritage and Archaeological Assessment West Wallsend Colliery Continued Operations Project

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Oceanic Coal Australia Limited

Project Director:	Barbara Crossley	
Project Manager:	Paul Amidy	
Report No.	2553/R03/Final	Date: July 2010



2/20 The Boulevard
PO Box 838
Toronto NSW 2283

Ph: 02 4950 5322
Fax: 02 4950 5737
Email: mail@umwelt.com.au
Website: www.umwelt.com.au

Acknowledgement

West Wallsend Colliery and Umwelt would like to acknowledge the Traditional Custodians of the Sugarloaf Range area – the Awabakal peoples – and pay respect to their cultural heritage, beliefs and continuing relationship with the land.

West Wallsend Colliery and Umwelt would also like to acknowledge the post-contact experiences of Aboriginal peoples who have attachment to the Sugarloaf Range area.

We pay our respect to the Elders – past, present and future – for they hold the memories, traditions, culture and hopes of Aboriginal peoples in the area.

West Wallsend Colliery and Umwelt thank the registered Aboriginal stakeholders for their participation in this project and for their valuable contribution to the assessment report which has been enriched by their willingness to share valuable aspects of their cultural knowledge.

Statements of Aboriginal Cultural Significance

The following statements of Aboriginal cultural significance have been prepared by each of the registered Aboriginal stakeholder groups participating in this assessment. As requested by the registered Aboriginal stakeholders, their statements of Aboriginal cultural significance have been included early in this report to ensure all readers recognise the cultural heritage value and importance of the Sugarloaf Range which incorporates the West Wallsend Colliery proposed continued underground mining project area. West Wallsend Colliery and Umwelt (Australia) Pty Limited recognise the primary role of the Aboriginal stakeholders registered for this project to affirm the Aboriginal cultural significance of the Sugarloaf Range landscape and the Aboriginal cultural features and Aboriginal archaeological sites it contains.

Awabakal Descendants Traditional Owners Aboriginal Corporation

You learn about your Country by observation, you learn its natural laws by experience, and you learn your future ways of life by watching your parents and imitating their ways' (Mary Foley Awabakal Ancestor, Grandmother - Awabakal Descendants Traditional Owners Aboriginal 25 March 2010).

This previous statement gives an insight into how it is, we as Awabakal Descendants are connected to our Ancestors and Traditional Country. How our ways are formed so as to always associate with and appreciate that Cultural Heritage passed down for generations by our Ancestors and why the knowledge of our Country we hold deep within our very being is uniquely ours. How is it we intuitively know where certain things are to be found, and why we feel things others don't - we find or know things that is physically impossible to know. Simply put, all of these things are part of us, they help to make us who we are, they are blueprinted to our very substance. We and our Ancestors are in one sense one in the same; therefore this part of our Culture survives the impacts of time.

This is why the Sugarloaf Range and the surrounding areas are of great significance and importance to our People, the Awabakal. It has been for many thousands of years and still is today part of our Traditional Country which has sustained us by providing areas in which our Ancestors have been supplied with the necessities of life, not just to simply survive, but to thrive. Evidence of this can be seen in the many Cultural Heritage sites that are contained within the Sugarloaf Range. The Rock Shelters, Grinding Grooves, Artefact Scatters, Stone Arrangements, Scarred Trees and other Culturally Significant areas that bare the marks of a People that were living their lives according to what was passed down to them, all learnt through careful observance of their elders.

As already pointed out the significance of place to our people is paramount but does not just rely on the presence of artefacts, grinding grooves, scarred trees or any visible evidence associated with the area. Although what does remain in the physical realm whether small or large, does in part connect us to our Ancestors and our Cultural Heritage being the physical reminder of what helped govern and guide the everyday lives of our people. We can reach out and touch and hold the very stones (artefacts) that they (our Ancestors) worked and fashioned into tools. We can visit the rock shelters and know they used these thousands of years previously. While at the grinding groove sites we can imagine being there with them as we touch the very surface of the sandstone they were sitting on and utilising in the production of an axe or to sharpen a spear.

*As the descendants of the original people whose families for many generations have lived in this area, we believe that our Traditional Tribal Country is not a landscape to be taken for granted or exploited as Europeans have done in years past by using various industrial methods which have led to the many problems experienced and carried through into this present day causing the degradation of the environment we see all around us. We do not want to see anything this significant to our people destroyed because of what is termed progress or because it is only recognised for its significance in regard to what is considered important in today's world, being the dollar value and the potential to extract as much coal and natural resources to satisfy those who have never seen the Cultural Heritage of our People or the beauty that this area has to offer. We have lost much in the past due to so called **progress** and these other factors which are attached to satisfy white man's ways of justifying the destruction of our Cultural Heritage. In today's climate there is offered many opportunities for developers to understand the significance of these areas and make the necessary adjustments to their plans and to realise their developments without impacting and causing destruction to these significant areas.*

The Sugarloaf Range is one of these areas; it is alive with the echoes of our Ancestors lives, it is what helps us make contact with our past. If it is allowed to be raped and plundered for its 'modern day' resources it is a fact that in the process it will destroy Awabakal Cultural Heritage and at the same time it will be destroying a part of what is intact at this very moment, our contact with the past.

Therefore it distresses us to be coerced into making decisions that are culturally inappropriate. We cannot support any damage to our Cultural Heritage sites whether accidental or wilful through the proposed underground mining activities by WWC. We have a Cultural mandate handed down to us by our Ancestors to protect and preserve what they have left us, which is their legacy, and in turn becomes our legacy to those in the future (Awabakal Descendants Traditional Owners Aboriginal 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

The Sugarloaf Range is a majestic, iconic landmark that features prominently within its surrounding landscape. Mt Sugarloaf illuminates this regions mythology, mystery and organic presence that are quite simply, uniquely Awabakal. The Sugarloaf Range still to this day has an undeniable amount of fascination and attention regarding its cultural value and purpose.

The Awabakal Traditional Owners have a personalised and an ever-revitalised bond with our ancestors' culture, tradition & heritage. This inexplicable connection is reverberated within the surrounding landscape of the Awabakal region. Additionally, we appreciate our unique role and responsibility for the care and protection of the integrity of this landscape, for and behalf of its original First Peoples and their descendants.

Though the Awabakal Traditional Owners Aboriginal Corporation's (ATOAC) Aboriginal 'Stakeholder' participation in this Aboriginal Cultural Heritage and Archaeological Assessment is supported by West Wallsend Colliery and endorsed by DECCW, our holistic attention for this mining operation is predominantly focussed by Awabakal 'lifestyle' and its environmental legacy, given the intrinsic right for the Awabakal descendants to champion our self-determining cultural directions.

We would like to take this opportunity to assert our focus on the critical flow of intergenerational equity and aim to ultimately safeguard the immeasurable life-changing impact this form of conservation can provide to this and future generations. Intergenerational equity lays the foundation for identifying, assessing, protecting and maintaining the important cultural and heritage values of landscapes, resources, places, objects, customs and traditions so that we, and generations to come, can enjoy, learn from them, and appropriately manage these values.

The Sugarloaf Range is organically and historically imbedded into the Awabakal landscape. Mt Sugarloaf is romanticised, photographed, talked about, visited, fought over, and all the time having its substructure relentlessly undermined for its natural resources. And yet, this landscape still hums a very distinctive 'human story' that still reverberates today.

We believe that the principles of the Awabakal tradition and culture still exist today to keep intact the moral and spiritual fibre of this land. Equally, we also believe it is essential to nurture new visions that are inspired by the cultural integrity of our ancestral family and we are encouraged that so many people in this town are focused on gaining an ever growing respect and understanding for the Awabakal Peoples, this land and environment.

This land has had a wealth of knowledge walk over it, with each one of us deepening the footprints of our ancestral family, the Awabakal People (Awabakal Traditional Owners Aboriginal Corporation 10 & 30 March 2010).

Awabakal Local Aboriginal Land Council

The Sugarloaf Range is still an important place for Aboriginal people especially the people of the Awabakal Nation. It is a place where we [the members of the Land Council] and the local Aboriginal community take our families, where we reconnect with the spirits of this land, breathe and recharge/revive our spiritual connections with the land.. Our Elders use Sugarloaf a lot, as a cultural teaching area as well as for recreational purposes. They get together up there ... and swap cultural information, their stories. They love to go there for picnics with Elders from a wide area and exchange cultural knowledge. We take our young people up there to show them the sites and to show them the plants and animals. From on top of Sugarloaf we can see all of the Awabakal and Worimi Lands and the places where people travelled through the country, where they hunted and fished and gathered their food and medicine plants. It is an extremely important teaching place (ALALC 2003:19).

As the legal custodians of the Awabakal lands, we the members of the Awabakal Land Council take this responsibility seriously. During our administration the Aboriginal people who have moved into this area, believe that all lands, rivers and ecology within the Awabakal boundaries is significant and should be respected and acknowledged as such. Although many of us come from other Nation groups this has not diminished our connections with the land or our love of the heritage and culture that is within the land and the people who reside in the country. From the Sugarloaf Range to the ocean the spiritual and physical connections with country will remain with the Aboriginal people who have chosen to reside within this area. (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

The Sugarloaf Range area is an extremely significant area to the members of Koompahtoo Local Aboriginal Land Council. It is an area where it is known that the Awabakal people went for ceremony related to male initiation. We know from our Elders that there are stone arrangements, grinding groove sites and scarred trees in the range country that are visible evidence of the Awabakal people that travelled to that Country and through that Country for ceremony, hunting and to gather food and medicine plants. There are camp sites on the ridges and spurs where evidence can be seen of Awabakal people making tools while they were visiting the range country. From the Sugarloaf Range the Awabakal people could look out over their Land including the coast and the sea, Lake Macquarie and the land between the coast and the range.

The Sugarloaf Range watches over the members of Koompahtoo Land Council every day, just as it watched over the Awabakal people that lived here when white people first came, and just as it watched over generations of Awabakal people in the past (Koompahtoo Local Aboriginal Land Council 9 March 2010).

Cacatua Cultural Consultants

Cacatua Cultural Consultants (17 June 2010) comments are located in **Appendix J** (for restricted access).

Abbreviations

ACHMP	Aboriginal Cultural Heritage Management Plan
ADTOAC	Awabakal Descendants Traditional Owners Aboriginal Corporation
ALALC	Awabakal Local Aboriginal Land Council
ATOAC	Awabakal Traditional Owners Aboriginal Corporation
CCC	Cacatua Cultural Consultants
CCL	Consolidated Coal Lease
DEC	Department of Environment and Conservation (previously the NSW EPA and the NPWS)
DECC	Department of Environment and Climate Change (previously DEC)
DECCW	Department of Environment Climate Change and Water (previously DECC)
DII	Department of Industry and Investment
DGS	Ditton Geotechnical Services Pty Ltd
DoP	Department of Planning
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
KLALC	Koompahtoo Local Aboriginal Land Council
LEP	Local Environmental Plan
MCJV	Macquarie Coal Joint Venture (MCJV)
ML	Mine Lease
NPWS	National Parks and Wildlife Service
NSWALC	New South Wales Aboriginal Land Council
OCAL	Oceanic Coal Australia Limited

PAD	Potential Archaeological Deposit
POM	Plan of Management (relates specifically to the NPWS POM for the Sugarloaf State Conservation Area)
ROM	Run of Mine
SCA	State Conservation Area
SSCA	Sugarloaf State Conservation Area
Umwelt	Umwelt (Australia) Pty Limited
UTM	Urban Tree Management
WWC	West Wallsend Colliery

Executive Summary

The area subject to the current development application is known as the West Wallsend Colliery Continuing Operations Project area (hereafter the proposed continued underground mining area). The proposed continued underground mining area and its surrounds are within the Sugarloaf Range area and the traditional lands of the Awabakal people (Threlkeld in Gunson 1974) (refer to **Figure 1.1** and **Figure 1.2**). The Sugarloaf Range area is of great cultural heritage significance to the Awabakal people and Aboriginal people that have made the Country of the Awabakal their home. The southern section of the proposed continued underground mining area is within the former Koopahtoo Local Aboriginal Land Council (KLALC¹) boundary, while the central and northern sections are within the Awabakal Local Aboriginal Land Council boundary (ALALC) as shown on **Figure 1.2**. Statements of significance supplied by the registered Aboriginal stakeholders have been given primary recognition in the preface of this report. These statements relate the very high Aboriginal cultural significance of the Sugarloaf Range area.

WWC is one of a number of active mining operations within the Newcastle Coalfields of New South Wales (refer to **Figure 1.1**). The Colliery is an underground mine located approximately 20 kilometres south-west of Newcastle. The underground coal mining operation at WWC targets the Borehole and West Borehole seams using the longwall extraction method. WWC is operated by Oceanic Coal Australia Limited (OCAL) on behalf of the Macquarie Coal Joint Venture (MCJV). WWC is the major joint venture participant of MCJV with 70% ownership. Other participants include Marubeni Coal Pty Ltd (17%), OCAL Macquarie (10%) and JFE Minerals (Aust) Pty Ltd (3%). Oceanic Coal Australia Limited, which also owns OCAL Macquarie Pty Ltd, is wholly-owned by Xstrata Coal (Australia) Pty Limited.

The Aboriginal cultural heritage and archaeological assessment presented in this report has been prepared as part of broader application under Part 3A of the *Environmental Planning & Assessment Act* (1979) (EP&A Act). Following cessation of its existing Part 5 Approval under the EP&A Act in December 2010, WWC will require development approval in relation to the proposed continued operation of underground mining at WWC.

The proposed continued underground mining area is 1085 hectares in size. Approximately 933 hectares (86%) of the proposed continued underground mining area is within the Sugarloaf State Conservation Area (SSCA) which was reserved in July 2007 (refer to <http://www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N1106>). The SSCA is 3973 hectares in area and incorporates 2139 hectares of the former Awaba State Forest, 1428 hectares of the former Heaton State Forest and 370 hectares of other lands (refer to <http://www.austlii.edu.au/au/legis/nsw/bill/npehrrb206578>). Underground mining is not precluded by reservation of lands as an SCA, however, mining in the SCA must be undertaken 'having regard to the conservation of the natural and cultural values of the state conservation area' (*National Parks and Wildlife Act 1974* Amendment (Section 15), Schedule 8 [3]).

The National Parks and Wildlife Service (NPWS – now part of the Department of Environment Climate Change and Water – DECCW) is currently preparing a Plan of Management (POM) for the SSCA, including a plan for management of Aboriginal cultural heritage. It is currently understood that the POM will be completed by 2013 (pers. com. Steve Wright - SSCA Ranger). The POM for the SSCA will include proposed management of potential subsidence impacts from the proposed continued underground operations of WWC. WWC has registered an interest in the development of the POM and will work in consultation with DECCW in the development of the POM.

^{1 1} KLALC was recently closed shortly after provision of comment on the working draft of this report.

The key features of the WWC Continued Operations Project are outlined in **Table 1**.

Table 1 – Key Features of West Wallsend Colliery Continued Operations Project

Major Project Components/Aspects	Proposed Operations
Limits on Extraction	Up to 5.5 Mtpa ROM
Estimated Mine Life	Approximately 12 years of mining
Operating Hours	24 hours per day, 7 days per week
Number of Employees	Approximately 390 full time equivalents
Mining Methods	Underground Mining – longwall method
Mining Areas	Proposed continuation of mining within CCL 718/725 and ML 1451 and encompasses all former workings of WWC
Infrastructure	Existing West Wallsend Surface Facilities at Killingworth Existing No.2 and No.3 Vent Shafts and ballast borehole Proposed future ventilation infrastructure Proposed Mining Services Facility

At this stage, there will be no major modification to the existing WWC pit top facilities as a result of the Project. Minor upgrades such as the proposed training building, potable water borehole, works associated with water re-use project and noise mitigation measures associated with the Bradford breaker and the No.2 vent shaft will all be located in previously disturbed areas

The proposed Mining Services Facility seeks to improve efficiency of delivery of materials to the underground operations by reducing the travel distance underground. It is proposed to be located approximately 6 kilometres south-west of the existing pit top facilities close to Wakefield Road, as shown on **Figure 1.2**. The Mining Services Facility will be comprised of a 20 metre by 35 metre compound housing the facility and a constructed access road off Wakefield Road. It will be located in an existing disturbed area between Wakefield Road and the F3 Freeway, currently comprised of an access area and regrowth vegetation. The Mining Services Facility is proposed to be used for a range of services including a ballast and concrete borehole (providing materials for use underground) and for the provision of solcenic oil for use underground. Power to the services facility will be provided by an extension of the existing powerline which is adjacent to Wakefield Road.

As underground mining progresses additional ancillary surface infrastructure associated with continued mining operations may also be required, including the installation of additional ventilation infrastructure and potential gas injection infrastructure. The locations of this infrastructure will be determined as mining progresses, with appropriate planning, to minimise environmental impacts, consultation and management strategies to be implemented for each new facility.

Whilst no further coal mining in the former workings of WWC is proposed as part of this Project, the former workings have been included in the project application boundary to provide a consolidated approval for all workings within the WWC holding, as requested by the Department of Industry and Investment (DII). This will provide for any future works required in those existing mining areas, such as ongoing maintenance works and work associated with mine closure.

Mine Plan Modifications

Following the completion of preliminary assessments as part of this Part 3A application and after extensive consultation with the registered Aboriginal stakeholders, significant changes were made to the proposed mine plan in order to protect two grinding groove sites of high Aboriginal cultural and archaeological significance (Palmer's Creek Grinding Grooves 1 #38-4-1007 and 2), an artefact scatter associated with a wet soak of high Aboriginal cultural and low to moderate archaeological significance (Western Domain 5 - #38-4-0993 - wet soak with artefact scatter site) and four landscape features of high Aboriginal cultural value (a stone arch and three rockshelter sites), as shown on **Figure 1.3**. The mine plan changes also reduced the level of predicted impact to a third grinding groove site of high Aboriginal cultural and high archaeological significance (Palmer's Creek Grinding Grooves 3). The modifications to the mine plan to protect the significant sites and landscape features have resulted in the sterilisation of approximately 2.04 Mt (estimated value of \$150 million) of coal resource.

The modifications to the mine plan to address impacts to landscape features of Aboriginal cultural value and Aboriginal archaeological sites of significance, were made by WWC with careful consideration to developing a mine plan which is as sensitive as possible to the surface cultural features above the proposed longwall mining area and still remaining economically feasible.

Following further consultation with the registered Aboriginal stakeholders and Umwelt in March and April 2010 (at the working draft report stage), WWC committed to protecting an additional five previously recorded sets of grinding grooves (#38-4-0607, #38-4-0608; #38-4-0622, #38-4-0636 Grinding Groove sites and #38-4-0599 Grinding Grooves and Possible Art site) to the north of the proposed continued underground mining area in ML 1451 (refer to **Figure 1.2**). During an inspection of these sites an additional grinding groove site (Burkes Creek Grinding Grooves 1) was also located. The six grinding groove sites were assessed as having extremely high Aboriginal cultural significance. Three of the grinding groove sites were assessed as having moderate archaeological significance and three of the grinding groove sites were assessed as having low to moderate archaeological significance. WWC proposed that they would not undertake any mining operations in the area of the Burkes Creek grinding groove sites that would cause any potential for damage to the sites (for details refer to **Section 8.7**). WWC provided for the protection of these sites in order to demonstrate Intergenerational Equity in relation to potential impacts from subsidence to the Diega Creek Grinding Grooves 1 site (refer to **Section 5.3.2** and **Section 8.7**). However, the registered Aboriginal stakeholders assessed that the Burkes Creek sites were not of equal value to the Diega Creek Grinding Grooves 1 site and thus while supporting their protection from future mining impact, did not support their protection as an offset for potential damage to the Diega Creek Grinding Grooves 1 site.

Aboriginal Stakeholder Consultation and Participation in the Assessment

The consultation and participation strategy for the assessment has been to involve registered Aboriginal stakeholders early in the process and to maintain an open ongoing dialogue throughout the assessment. This has involved consultation with registered Aboriginal stakeholders at key times within early stages of the project and incorporation of their comments, advice and recommendations into project design and strategic decision making.

Consultation for the Project was undertaken in compliance with the DECC's *Interim Community Consultation Requirements for Applicants* (ICCRs - 2004). The notification process required under the ICCRs resulted in the registration of five Aboriginal stakeholder groups: Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC), Awabakal Local Aboriginal Land Council (ALALC), Awabakal Traditional Owners Aboriginal

Corporation (ATOAC), Cacatua Culture Consultants (CCC) and Koombahtoo Local Aboriginal Land Council (KLALC).

A number of meetings were held with the five registered Aboriginal stakeholder groups during December 2008 to workshop the survey strategy for the proposed continued underground mining area. A detailed summary of these meetings is included in the consultation log in **Appendix A**. At the meetings a draft survey methodology was presented as a starting point for discussion. Several modifications to the draft survey strategy were made following the discussion with the registered Aboriginal stakeholders at the workshops and the final survey strategy was endorsed by all registered Aboriginal stakeholders prior to the commencement of the field program (refer to **Section 4.1** and **Appendix B**).

During the field survey the precise location of transects was selected by all participants collaboratively. In addition to the recording of archaeological sites the locations of landscape features of cultural value identified by survey participants were also recorded. Consultation regarding survey coverage was conducted during the survey prior to the finalisation of the field program to ensure that all registered Aboriginal stakeholders were satisfied with the level of investigation on which this assessment would be primarily based (refer to **Appendix A**). As a result of Aboriginal stakeholder comments and advice, additional survey was instigated prior to the end of the fieldwork period. It is further noted that ADTOAC and ATOAC raised concerns regarding the survey limitations specifically in relation to more coverage of areas they thought likely to have rockshelters. Agreement was reached, however, that survey coverage was adequate for this assessment, though it was noted by ADTOAC and ATOAC that additional survey could lead to the recording of more sites as the survey only sampled the proposed continued underground mining area.

Prior to finalisation of the proposed continued underground mining area mine plan, meetings were held with the five registered Aboriginal stakeholder groups (meetings were held from 3 to 16 April 2009 - refer to **Appendix A**). The purpose of these meetings was to obtain preliminary advice and comment regarding the cultural significance of the overall proposed continued underground mining area and the sites and landscape features recorded during the field survey undertaken to that date. Prior to strategic decisions regarding finalisation of the mine plan, an explanation of the Aboriginal cultural significance of the area surveyed and the sites/landscape features recorded to that date was provided to WWC. The early provision of this information was to ensure that it could be taken into consideration (where possible relative to overall mine feasibility) in the final mine plan. Based on the advice of the registered Aboriginal stakeholders at this time WWC modified the mine plan to protect Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2, Western Domain 5 - #38-4-0993 and to lessen the level of impact on Palmers Creek Grinding Grooves 3 (refer to **Figure 1.3**) as noted above.

A working draft assessment report was prepared that detailed the background to the project, the findings of the survey, the archaeological significance of the Aboriginal archaeological sites within the proposed continued underground mining area and the management/mitigation/conservation offset options thought appropriate from an archaeological perspective. The working draft report also took into account advice, comments and management recommendations provided by the five registered Aboriginal stakeholder groups throughout the survey and assessment process undertaken to that date.

In early March 2010, the working draft report was provided to the Aboriginal stakeholder groups and meetings were held over the period 2 to 25 March 2010 with the aim of having the registered Aboriginal stakeholders prepare sections of the report related to Aboriginal cultural values, Aboriginal cultural significance of the Sugarloaf Range area and site and landscape features recorded during the survey and the provision of advice and comment for inclusion into the proposed management outcomes and management strategies (refer to the **Statements of Aboriginal Cultural Significance** in the preface of this report and

Sections 1.0, 3.0 Part A, 5.2, 6.1, 7.0, 8.0 and 9.0 and Appendices A, B, J, K and L²). This process allowed the registered Aboriginal stakeholders the opportunity to use their own voice to contribute directly into the reporting process and to identify the extremely high Aboriginal cultural significance of the Sugarloaf Range area and the landscape features and Aboriginal archaeological sites it contains. It also allowed the opportunity to raise concerns in relation to cumulative impacts of development on Aboriginal cultural heritage within the Sugarloaf Range area.

Advice was also provided by the registered Aboriginal stakeholders on the use of culturally appropriate language and terminology and many sections of the report were revised and the report was reconfigured substantially in response to this advice.

Following receipt of comments and advice from all Aboriginal stakeholders registered for the project; the working draft was made into a final draft report, which was circulated for further registered Aboriginal stakeholder comment and advice on 17 May 2010. All further comments were incorporated into the final report during the period 1 June 2010 to 20 June 2010.

It is noted that that KLALC closed shortly after the provision of comments on the working draft report and thus was unable to comment on the final draft. The final draft was provided to the NSWALC with a letter identifying that KLALC had commented on all aspects of the continued underground mining area that related to its LALC zone. The only aspect on which KLALC had been unable to provide comment prior to closure was on the Research Design and Methodology (refer to **Appendix I**). In relation to the Research Design and Methodology, feedback was received from the four other Aboriginal stakeholder groups registered for the continued underground mining project. NSWALC (Stephen Merritt, Zone Director NSWALC pers. com. 3 June 2010) advised that they would be taking responsibility for matters pertaining to Aboriginal cultural heritage in the former KLALC area and that they would participate in any consultation arising post-Approval.

Aboriginal Cultural Knowledge and Values of the Sugarloaf Range Area

Awabakal Descendants Traditional Owners Aboriginal Corporation

We know that the roadways and logging tracks present in the continued underground mining area today have been constructed along the original tracks that were used by our People, the Awabakal, as they used these areas and travelled through to the various other areas within their Traditional Country. We would then expect to find areas that were camp sites on the ridgelines and spur crests where the tracks are, or close by. (Shane Frost ADTOAC - 29 October 2009)

As children growing up, we lived in and were taken into many areas of the Traditional Country of our Ancestors. As a result, we were told 'stories' that had been passed down for centuries that related to these areas. These vivid 'stories' that were told to us then and viewed through children's eyes, now give us a clearer insight into our Cultural Heritage as adults. These 'stories' told about the lake, creeks and waterholes, the mountains and landscapes within the surrounding areas and how they are intrinsically connected. One of these 'stories' gives us insight into the importance of the Sugarloaf Range in its entirety, from one end to the other and the connection that several important features that exist within its terrain have with each other and also with other features within our Traditional Country, but then, how they also separately exist in their own right.

² Please note that **Appendices J and L** are not for public display.

We would love to tell these 'stories' here but we believe it is not for others at this time. So we would reserve this right as Awabakal People to hold onto this part of Our Cultural Heritage for the present moment.

What we are trying to say here is that although the Sugarloaf Range is quite a large physical feature within this area, it is but one of many significant features (both large and small) that are fused together into a much larger picture but at the same time uniquely separate. This is conveyed through our Oral history which in turn can divulge certain Spiritual accounts also of our People, the Awabakal. This is why we reserve the right not to reveal certain information here. (Awabakal Descendants Traditional Owners Aboriginal 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

"Mt Sugarloaf still to this day is an impressive Awabakal Dreamtime landmark, bearing physical reminders of our Awabakal ancestral families' lifestyle and presence. The amount of physical sites may never be fully known, but even if every single site is not found, we believe that the cultural integrity and organic value still remains a constant for our lives.

When we visit Mt Sugarloaf, there is an inexplicable spiritual reaction to the landscape and at times someone becomes intuitively drawn to or affected by a particular site, as if the ethereal environmental space is meshing with someone's 'cultural DNA'" (Awabakal Traditional Owners Aboriginal Corporation 10 & 30 March 2010).

Additionally,

"There are some of us who are fortunate enough to have stories passed down through the generations of time but this communication or 'oral history' is meaningless unless we keep these ancient whispers alive. To me oral history is a 'living letter' passed between generations, making sure that those who are following in the footprints of their ancestors will hear these same whispers that are essential to life.

Of course we as a family have been told stories about past generations, their personalities, their relationships and what they all did here in their traditional lands. However at the end of the day, all the stories, customs and traditions are there for people to connect with each other and, explore the mysteries of life.

One day I hope we all realise the importance of this before it's too late. This is one of my Awabakal dreams" (Nola Hawken, ATOAC 17 March 2010).

Additionally,

"When the Sugarloaf Mountain Range is viewed from any direction we know we are looking at a place our People have continually visited, and it is something that is symbolic to us. When we go up there and visit the sites it is like looking at a reflection of our ancestors. We know these sites are part of our lives and that familiarity can sometimes be taken for granted, but it is those landmarks and features that define us within our Awabakal country. It is a special place, and the connectivity between other special places like Nobbys, Wollombi and Sugarloaf, just to name a few, it's not just about the place, but what our culture means to us as Awabakal people and how we are connected with our cultural places" (Kerrie Brauer, ATOAC 17 March 2010).

Awabakal Local Aboriginal Land Council

In the past ALALC has spoken of the ceremonial importance of the Sugarloaf Range area, the restriction of access to some areas that were related to men's business, to the fact that there are stone arrangements, scarred trees, burials, grinding grooves, and potholes in association with grinding grooves that have been ground out to make them larger so they hold water for longer, and also direction markers (some were stones and some were grooves in the rocks). The following quotes are excerpts from a report that ALALC prepared in relation to the importance of the Sugarloaf Range area in 2003.

The Sugarloaf Range is ... important to us - it allows us to keep our ties with the past. We must preserve our ties with the past; we must not lose our traditions which are all part of our connection to the land and our sense of belonging. We must try and keep Sugarloaf as natural as we possibly can. We have to have progress ... but we as Aboriginal people are losing our identity as a community and we need to be able to get back to places like the Sugarloaf area, it's very important that we have these places to show our young people, educate our kids back to our culture.

Our [Aboriginal] culture is written there in the Sugarloaf Range, written in the caves, written on the ground, written on the trees, it's all around. We need to be able to go to these places to teach the kids how to read the land. Our kids have been missing out; sadly they do not respect their Elders. Getting back to the land with the Elders will teach our kids respect for the Elders, for the land and for themselves. We would not have jails bulging with young Aboriginal people if they had the chance to learn about their culture, to have the chance to preserve their past, to preserve the land as natural as it can be, we must not lose our tradition and connection to the land.

Sugarloaf has a big toolmaking area ... they ground axe heads all over the top of there, there is a lot of places where they rubbed them... It was very important to have this sandstone to grind the axe heads which was a very important part of tribal life, the axe. It played a big role in the survival of the Awabakal people, not only for hunting but it was used too, in defence at odd times. This will give you some idea ... how important and how significant these sites are up at Sugarloaf.

They used ground out pot holes to hold water to use as part of the rubbing down of the axe, they would have a little bark bowl there to scoop up the water and it is very important that water was used. That's why you can see how well it has been used over thousands of years. Some of these pot holes are pretty deep you know, especially up there. ... When it was a bit dry the water would stay there, in the deep pools, there where water would stay well covered over where the sun wouldn't dry the water out...in this area too there is one waterhole, you know the Aboriginal oral tradition reckons it never runs dry, you know orally speaking, but there's a few waterholes up there. This area is rich in stuff like that, Sugarloaf, and it's very important. It's not only as it has a physical significance to Aboriginal people, but spiritual side too, because this is where we are going to bring our young men back up and show them how they actually done the waterhole and to make tools and that. It is very important to pass the knowledge on to this young generation, actually how they done that, and the importance of it, so Sugarloaf is very important.

Direction markers were important things. Oh yes. People made different signs for different things, it's very important to read the land, very important. Just like today we have road signs, street signs to give directions to the people travelling.

We have different grinding grooves to show where the waterholes are and things like this. This stuff is very important and we have signs on the ground, prints, emu prints and things like that pointing to different areas. ... The idea is to leave a story behind and it was for the survival of the whole clan, and there is stuff there anyone coming through from different tribal areas, they could look, and they have the same thing up there. They can understand. It was left there for them for directions to the waterholes and for what to eat.

There are crying trees in the Sugarloaf Range, you get them right through the country, we've found them at Wollombi, Murrays Run, Belmont, Cessnock and Cooranbong. When I see a crying tree I know right away that there are graves around and this means the area is not suitable for burial underground and so they sit them up and cover them over. They usually use the gum trees with the white bark so you see the red stains like tears running down ... these cuts in the tree they symbolise that there is a grave in the area. Like a tombstone with a name on it, the cuts symbolise that a person or people are buried in the area. Well this is how traditional Aboriginal people mark their grave sites. The little cuts make the tree weep; the sap runs down like tears. They mark it with teardrops, a tombstone, to let us know that there is a grave there and to respect them tears. When we are on site surveys if we see this type of tree we know that there is a grave there, or a couple of graves there and it is very important that we look for that because sometimes you don't get the sandy soil where you naturally think "oh, it's easy digging for a gravesite" and sometimes, on a number of occasions we have come across where the grave is a sitting up one. You know sometimes they buried them sitting up, they weren't always laid down. The cuts on the tree, the tears, that was a symbol to let people know that there was a grave there.

Koompahtoo Local Aboriginal Land Council

KLALC Elders and many of our members have spent a great deal of time in the Sugarloaf Range area. They still like to visit to see the sites up there, especially the grinding groove sites which are very significant to them. They tell us how the men ground their axes and other tools up there and how they ground out the little potholes in the rocks in the creeks to make them larger so that they would hold more water and hold it for longer. The Elders love to visit the area to see and sometimes gather the plant and medicine foods that grow up there that you can't find anywhere else except up in the range.

From the top of the range you can see all over Awabakal lands, the range, the hinterland, Lake Macquarie and the sea. The Elders tell us that men went up into the higher parts of the range for ceremony and we know that there are sites up there related to ceremony like stone arrangements and scarred trees and direction markers. Some of the scarred trees are very special as they have had large shields removed that were used in ceremony and some trees with white bark have been cut so that the red sap runs down like tears. We call these crying trees and they mark burials. There are also camp sites where people stopped for the night or maybe just a meal while they were up in the range. A lot of our favourite bush tucker grows up there and there are giant grass trees that must have been there for generations of Awabakal people and generations of the Aboriginal people that are now members of Koompahtoo Local Aboriginal Land Council.

The Sugarloaf Range, including the area proposed by WWC for their underground mine is very important to us, very significant and we want the sites and places up there looked after properly so that future generations can visit the sites and learn more about the Aboriginal past of this area. We want to be able to continue to go up there and see the sites and we want our grandchildren and great grandchildren and their great grandchildren to be able to do the same (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

Previous Survey and Assessment

A number of Aboriginal cultural heritage and archaeological assessments have been conducted within the proposed continued underground mining area and immediate surrounds, including assessments pertaining to previous phases of continued operations at WWC. A search of the DECCW Aboriginal Heritage Information Management System (AHIMS), indicated that prior to the current survey, 62 Aboriginal sites were registered within a 6 kilometre radius of the centre of the proposed continued underground mining area. These consisted of 33 sites with stone artefacts (isolated finds and artefact scatters), 24 sets of grinding grooves, one set of grinding grooves associated with a waterhole/well, one set of grinding grooves in association with a rockshelter with potential archaeological deposit (PAD), one set of grinding grooves possibly associated with art (a possible macropod track), one scarred tree and one potential archaeological deposit. Thirteen of the previously recorded sites occurred within the proposed continued underground mining area including: three grinding groove sites (please note that during the survey it was found that the registered location of one of these sites was incorrect and that it was located just outside the proposed continued underground mining area boundary), five isolated finds, four artefact scatters and the Western Domain 5 site #38-4-0993 - wet soak with artefact scatter (for site locations refer to **Figures 3.4** and **3.5**).

In the broader Sugarloaf Range area and within the SSCA it was found that grinding groove sites were the dominant site type listed on the DECCW/AHIMS. The dimensions of the grooves recorded indicated that the grinding of axes, hatchets and adzes had been occurring in the area. The DECCW/AHIMS search indicated that 52 grinding groove sites were registered within the Sugarloaf Range area and that 34 of these were within the SSCA and under the management of the NPWS/DECCW. The grinding groove sites were located within the upper catchment of creeklines on the eastern fall of the Sugarloaf Range (28 sites) and within the very uppermost catchment of creeklines on the western fall of the Sugarloaf Range (24 sites). One of the grinding groove sites (Cockle Creek 1 #38-4-0118) within the Sugarloaf Range (eastern fall) is known to have been impacted (cracked) by mining/development (for site locations refer to **Figure 3.4**).

Three stone arrangement sites (consisting of four circular stone arrangements) were also registered within the Sugarloaf Range area but none of these were within the SSCA. Two of the stone arrangement sites are proposed to be protected within a conservation area during the construction of the Hunter Expressway (Umwelt 2010), however, no long term conservation is currently proposed for any of the stone arrangements (for site locations refer to **Figure 3.4**).

There were no scarred trees or Aboriginal archaeological rockshelter sites registered on the DECCW/AHIMS within the Sugarloaf Range or SSCA. Brayshaw (1994, 2001), however, did report a rockshelter with PAD in Burnt Creek in the north-eastern extent of the Sugarloaf Range (outside the SSCA) and numerous rockshelters without evidence of occupation are

known from the Aboriginal oral history and previous surveys to occur in the area (refer to **Section 3.0 Part C** for details).

From **Figure 1.2** it can be seen that mine leases (MLs) cover a large proportion of the SSCA and the Sugarloaf Range and its general environs. The breakdown of registered sites identified to date within mine leases is as follows (refer to **Figure 3.4**):

- Tasman Mine Lease contains 23 grinding groove sites, one stone arrangement, one PAD and four artefact scatters;
- WWC CCL 725 contains seven grinding groove sites (one has been destroyed), one stone arrangement, three scarred trees, one PAD and 27 artefact scatters;
- WWC CCL 718 has five grinding groove sites and four artefact scatters;
- WWC ML 1451 has six grinding groove sites, and one grinding groove with possible art (described as a possible engraved macropod footprint); and
- Newstan ML has nine rockshelters with artefacts and/or PAD, one rockshelter with axe grinding grooves, two grinding groove sites, one grinding groove site/waterhole/well and seven artefact scatters and 15 shell midden sites.

Tasman Mine is using bord and pillar extraction and thus is only causing negligible subsidence which will not impact upon surface sites; so it is understood that all sites within its mine lease are extant. Tasman will be required to modify its approval to impact any of the sites in its ML. Newstan Colliery has suspended operations and is currently under care and maintenance and has at this stage not undermined any of the rockshelter or grinding groove sites in its ML. If Newstan Colliery did recommence operations it will be required to obtain relevant approvals from DECCW in order to impact any of the sites in its ML. A small section of the southern extent of ML 1451 is within the proposed continued underground mining area boundary and is subject of the current assessment. WWC would be required to undertake further assessment if in the future it had plans to mine the remainder of the ML 1451. As noted above, only one of the grinding groove sites (Cockle Creek Grinding Grooves #38-4-0118 in CCL 725) within the MLs is known to have been damaged (cracked) by mine related subsidence (for site locations refer to **Figure 3.4**). Based on the DECCW/AHIMS data and relevant reports the remainder of the sites are extant. Of the 120 sites listed above in the broader Sugarloaf Range area, 37 sites are within the SSCA including:

- 15 grinding groove sites in the Tasman Mine Lease;
- five grinding groove sites and four artefact scatters in CCL 718;
- six grinding groove sites and one grinding groove with possible art in ML 1451; and
- one grinding groove site/waterhole/well and one artefact scatter in the Newstan Mine Lease.

All 35 known sites in the SSCA and in mine leases are still extant. The 35 sites within the SSCA and within mine leases will be managed in accordance with the POM for the SSCA when it is completed in 2013. According to the DECCW AHIMS a further five sites (all grinding grooves³) occur in the SSCA that are outside mine leases. These will also be managed under the POM for the SSCA.

³ A sixth grinding groove site is now known to occur outside MLs and within the SSCA. Incorrect grid coordinates had been supplied to DECCW for site #38-4-0462. More accurate recording in January 2010 indicated the site was outside the proposed continued underground mining area. A new site card will be supplied to DECCW.

Results of the Survey

The bulk of the field survey within the proposed continued underground mining area was undertaken between 9 February and 21 April 2009. One additional half day of survey was undertaken on 23 October 2009 to inspect the area proposed for the mining services facility and an adjacent road reserve proposed for the installation of four to five power poles. During the course of the survey 17 landscape features were recorded that were assessed by the registered Aboriginal stakeholders as having Aboriginal cultural value. The features included a spring, a second wet soak, a stone arch, a rock that had the appearance of a kangaroo's head (Kangaroo Rock), two stone cairns/stacks, a clay pigment source and 11 rockshelters (eight of which are within the proposed continued underground mining area - refer to **Figure 5.2**). The landscape features did not have associated archaeological evidence (though Aboriginal archaeological sites were located in the general vicinity of some of the landscape features) and/or were not assessed as archaeological in nature and thus they were not recorded as Aboriginal archaeological sites; however, as noted above, the Aboriginal cultural significance of these landscape features was acknowledged and the mine plans were modified in recognition of the Aboriginal cultural value of the stone arch and this in turn protected one of the rockshelters. In addition, significant modifications to the mine plan undertaken to protect the Western Domain 5 site (#38-4-0993) also protected a further two of the rockshelters.

Table 2 provides a summary of the Aboriginal archaeological sites located during the survey. The table includes the newly recorded and previously recorded sites and includes a small number of sites that were located during the survey but which were just outside the proposed continued underground mining area. The sites were summarised by catchment area in order to observe whether there was any patterning apparent in the way that the Awabakal people were utilising the section of the Sugarloaf Range within the proposed continued underground mining area. The site locations are shown on **Figure 5.3**. From **Table 2** and **Figure 5.3** it can be noted that:

- a total of 62 sites were recorded during the survey/previous surveys within and in proximity to the proposed continued underground mining area;
- 51 of the sites were within the proposed continued underground mining area boundary;
- 47 of the sites within the proposed continued underground mining area are within the area proposed for impact by subsidence;
- two of the sites are in an area proposed for indirect impact by subsidence related factors;
- one of these sites (#38-4-0462 Grinding Grooves and Associated Rockshelter⁴) was previously thought to be located within the proposed continued underground mining area, however, more accurate recording revealed that it was outside);
- six site types were recorded:
 - grinding grooves (19⁵);
 - grinding grooves associated with a rockshelter with an isolated find and no PAD (1);
 - a rockshelter with artefacts and PAD (1);
 - artefact scatters and isolated finds (36);

⁴ The DECCW AHIMS site card records only the grinding grooves and not the rockshelter or isolated find.

⁵ ADTOAC would like it to be noted that the Cockle Creek Grinding Grooves 1 site was located near a rockshelter that they believe would have been used by Aboriginal people; however, there was no visible archaeological evidence of the use of this rockshelter and it was not recorded as part of the site. It was, however, recorded as a landscape feature of Aboriginal cultural value.

- scarred trees (3); and
- stone arrangements (2).

When the sites were assessed in relation to the catchment in which they were located it was found that:

- Cockle Creek (39%) and Diega Creek (35%) catchments had the highest percentage of total sites followed by Bangalow Creek (18%), Palmers Creek (5%) and Boggy Hole Creek (3%);
- Bangalow Creek (45%) and Diega Creek (30%) catchments had the highest percentage of grinding groove sites;
- Bangalow Creek (44%) and Palmers Creek (33%) catchments had the highest percentage of grinding grooves; however
- Palmers Creek catchment had the greatest diversity of grinding groove types;
- Cockle Creek (53%) and Diega Creek (36%) catchments had the highest percentage of artefact scatter and isolated find sites;
- Cockle Creek (53%) and Diega Creek (38%) catchments had the highest percentage of artefacts located within the artefact scatter and isolated find sites;
- Diega Creek catchment had the artefact scatter with the highest number of artefacts (46 in GNW1 – #38-4-0995);
- only one rockshelter with artefacts and PAD was located and it was in the Cockle Creek catchment;
- one rockshelter with a single surface artefact and no PAD was located within the Bangalow Creek catchment in association with the #38-4-0462 site;
- two stone arrangements were located; one within the Cockle Creek catchment, and one within the Diega Creek catchment; and
- Aboriginal scarred trees were confined to the Cockle Creek (1) and Diega Creek (2) catchments.

Overall, from the site analysis it appeared that the Cockle Creek and Diega Creek catchments were important resource areas/occupation areas that were favoured for most activities (with the exception of stone implement grinding in the Cockle Creek catchment within the proposed continued underground mining area boundary). Bangalow Creek and Palmers Creek catchments while being favoured areas for the grinding of stone implements appear to have been less favoured for other activities. However, it should be noted that a much larger area of the Cockle Creek and Diega Creek catchments are within the proposed continued underground mining area while only the very upper reaches of Bangalow Creek, Palmers Creek and Boggy Hole Creek were within or in proximity to the proposed continued underground mining area. Thus the differences observed in site types, site occurrence and site density are most likely being biased by the differences in landforms (especially related to gradient) and the size of the areas being surveyed between the catchments.

Table 2 - Summary of Sites/Catchment Area

Catchment	Grinding Groove Sites (% total Grinding Groove sites)	# Grooves (% total Grinding Grooves)	Type of Grooves	Artefact Scatters/Isolated Finds (% total Artefact Scatter and Isolated Find Sites)	# Artefacts (% total Artefacts)	Rockshelter with Artefacts/PAD	Stone Arrangements	Scarred Trees	Total Sites (% total sites)	# Site Types
Bangalow Creek	9 (45%) Including one grinding groove site with an associated rockshelter no PAD	86+ (44.3%)	axe, hatchet, food or ochre preparation	2 (6%)	9 (4%)	0	0	0	11 (18%)	3 (including rockshelter associated with grinding groove site)
Boggy Hole Creek	0 (0%)	0 (0%)	N/A	2 (6%)	13 (5%)	0	0	0	2 (3%)	1
Cockle Creek	2 (10%)	3+ (1.5%)	hatchet	19 (52%)	130 (53%)	1 (100%)	1 (50%)	1 (33.3%)	24 (39%)	5
Diega Creek	6 (30%)	42+ (21.6%)	axe, hatchet	13 (36%)	94 (38%)	0	1 (50%)	2 (66.7%)	22 (35%)	3
Palmers Creek	3 (15%)	63 (32.4%)	axe, hatchet, chisel spear point and/or direction marker	0 (0%)	0 (0%)	0	0	0	3 (5%)	1
Total	20	194+	5 types	36	246	1	2	3	62	6 types

Significance Assessment

Aboriginal Cultural Significance

Detailed statements relating to the significance of the landscape features identified as having cultural value and the Aboriginal archaeological sites were provided by the registered Aboriginal stakeholders (refer to **Section 6.1** and **Figure 6.1**). In relation to the landscape features it was assessed that:

- the stone arch had extremely high Aboriginal cultural significance;
- 'Kangaroo Rock', the pigment source, the spring, the second wet soak and the 11 rockshelters had high to very high Aboriginal cultural significance; and
- the stone cairns/stacks were assessed as having low to moderate Aboriginal cultural significance.

In relation to the Aboriginal archaeological sites it was assessed that:

- the stone arrangements had extremely high Aboriginal cultural significance;
- the grinding groove sites had from very high to extremely high Aboriginal cultural significance;
- the Cockle Creek Rockshelter with Artefacts and PAD had extremely high Aboriginal cultural significance;
- the scarred trees had very high to extremely high Aboriginal cultural significance;
- the Western Domain 5, Brunkerville Trail and GNW artefact scatter sites had very high to extremely high Aboriginal cultural significance; and
- the remainder of the artefact scatters and isolated finds had moderate to very high Aboriginal cultural significance.

Overall the continued underground mining area and the identified landscape features and Aboriginal archaeological sites it contains were assessed as having high to extremely high Aboriginal cultural significance.

Archaeological Significance

The archaeological significance of Aboriginal archaeological sites is assessed according to their research potential. Six criteria were taken into account when assessing archaeological significance: rarity, representativeness, integrity, connectedness, complexity and potential for archaeological deposit (refer to **Section 6.2** and **Figure 6.2**). These criteria were assessed within a local and regional context. In summary:

- 33 isolated finds and artefact scatters were assessed as having low overall archaeological significance (53% of the assessed sites);
- seven grinding groove sites and three artefact scatters were assessed as having overall low to moderate archaeological significance (16% of the assessed sites);
- two grinding groove sites and three scarred trees were assessed as having overall moderate archaeological significance (8% of the assessed sites);

- five grinding groove sites and two stone arrangements were assessed as having overall moderate to high archaeological significance (11% of the assessed sites); and
- six grinding groove sites (including #38-4-0462 Grinding Grooves and Associated Rockshelter site) and one rockshelter with artefacts and PAD were assessed as having overall high archaeological significance (11% of the assessed sites).

High levels of prior disturbance and erosion (related mainly to historic impacts by logging practices including track construction, maintenance and use) are the main factors that led to the high percentage of the artefact scatter and isolated find sites that were assessed as having low overall archaeological significance.

As noted above, following the archaeological survey the mine plan was modified to avoid impact to the Palmers Creek 1 (#38-4-1007) and Palmers Creek Grinding Grooves 2 sites of extremely high Aboriginal cultural and high archaeological significance and the Western Domain 5 (#38-4-0993 - wet soak with artefact scatter site) of very high Aboriginal cultural and low to moderate archaeological significance. The mine plan modifications also reduced the impact predicted to the Palmers Creek 3 Grinding Groove site of extremely high Aboriginal cultural and high archaeological significance and protected a further three rockshelters of Aboriginal cultural value.

It was also noted during the survey period that the previously recorded grinding groove site (#38-4-0462) within the Bangalow Creek catchment had not been accurately mapped when initially recorded. Due to the steep gradient of the valley sides and dense vegetation in this area it was assessed that surveyors should plot the sites in the Bangalow Creek catchment to ensure that accurate locations were known in relation to the longwall layout. The revised location of site #38-4-0462 Grinding Grooves and Associated Rockshelter placed the site outside the proposed continued underground mining area (refer to **Figure 5.3**).

Research Potential

It is assessed that it is highly unusual for a project area, even very large project areas, to contain such a wide variety of site types (6) and such a large number of site types generally thought of as rare, including stone arrangements, grinding grooves, scarred trees, a rockshelter associated with grinding grooves and a rockshelter with artefacts and PAD; plus a large number of sites containing stone artefacts (isolated find and artefact scatter sites). This is an extremely rare occurrence on a regional scale (lower Hunter Valley), though less rare on a local scale (the Sugarloaf Range area). That this is the opposite of what is usually found for project areas, clearly indicates that the proposed continued underground mining area and the broader Sugarloaf Range area (incorporating the SSCA) has the potential to provide substantial archaeological information in relation to Awabakal use of the landscape if it is researched in far more detail than allowed within the EA assessment process.

Thus the proposed continued underground mining area when viewed in its entirety is assessed as having moderate to high archaeological research potential. Some sites and areas such as those highlighted within **Sections 6.2.2 to 6.2.4 and 6.2.8** may have higher research potential than others, but as a whole the proposed continued underground mining area and the broader Sugarloaf Range/SSCA in general must be seen as an area worthy of further archaeological investigation.

Impact Assessment

All 62 Aboriginal archaeological sites assessed for their Aboriginal cultural and archaeological significance were also assessed for potential to be impacted directly or indirectly by subsidence or directly by subsidence remediation works (refer to **Section 7.0** -

please note that no impacts to Aboriginal archaeological sites/landscape features of Aboriginal cultural value are proposed by surface infrastructure).

The potential impacts arising from subsidence and subsidence remediation works to Aboriginal archaeological sites was assessed by Ditton Geotechnical Services (DGS) Pty Ltd (2009) (refer to **Appendix G**). DGS assessed the potential for damage to the Aboriginal archaeological sites and landscape features based on predictions for 'final subsidence, tilt, strain and surface gradient change contours' (DGS 2009).

In relation to artefact scatters, isolated finds, scarred trees and the stone arrangements, direct impacts are possible from ground surface cracking and subsequent remediation works. Direct impacts from the cracking of the sandstone platforms, benches or creekbeds on which the grinding grooves are located is possible for 15 grinding groove sites within the proposed continued underground mining area. Cracking of the walls, floor, deposit and roof fall is possible for the one rockshelter recorded as an Aboriginal archaeological site (Cockle Creek Rockshelter with Artefacts and PAD) and five of the rockshelters recorded as having Aboriginal cultural value. Indirect impact in the form of increased erosion and/or sedimentation is possible for all site types. There is also the possibility of loss of waterflow across grinding groove locations due to cracking of the creekbed either within or upstream of sites.

In summary, it is considered that the project has the potential to impact to varying extents on 49 (79%) of the 62 sites assessed. Of these sites 11 have extremely high Aboriginal cultural significance, nine have very high to extremely high Aboriginal cultural significance, two have high to very high Aboriginal cultural significance, three have very high Aboriginal cultural significance, 17 have moderate to high Aboriginal cultural significance and seven have moderate Aboriginal cultural significance. Seventeen of these sites also have moderate, moderate to high or high archaeological significance. Three sites (two grinding groove sites and one artefact scatter of extremely high and very high to extremely high Aboriginal cultural significance respectively and high and low to moderate archaeological significance will not be impacted due to mine plan changes. An additional grinding groove site (Palmer's Creek Grinding Grooves 3) of extremely high Aboriginal cultural significance and high archaeological significance has a lower assessed potential for impact (reduced from >25% to between 5 and 15%) due to the revision of the mine plan to increase the width of the chain pillar proposed beneath the site.

A number of the sites were assessed by the registered Aboriginal stakeholders as being ceremonial in nature and of special significance.

In relation to the landscape features assessed for impact by DGS (2009):

- no impact is predicted for nine or 53% of all features. These features are of high to very high or extremely high Aboriginal cultural significance. Four of these (a spring and three rockshelters) are outside the proposed continued underground mining area), three rockshelters and the stone arch will not be impacted due to mine plan changes in recognition of their Aboriginal cultural significance, and one feature, a free standing boulder (Kangaroo Rock), will not be impacted by subsidence; and
- damage is predicted to the remaining eight or 47% of the landscape features (stone cairns/stacks, five rockshelters, the pigment source in the bank of Bangalow Creek and a second wet soak in the Diega Creek catchment of low to moderate to high to very high Aboriginal cultural significance).

In summary, mine plan modifications have protected two significant grinding groove sites and one artefact scatter site associated with a wet soak and four landscape features (a stone arch and three rockshelters). Mine plan modifications have also reduced the likelihood of

impact to a third significant grinding groove site. In addition, nine landscape features of cultural value will not be impacted due to four being outside the impact area (the spring and Rockshelters 5, 6 and 9), four being protected by mine plan modification (Rockshelters 1, 2 and 8 and the stone arch) and as one is a freestanding boulder (Kangaroo Rock). One grinding groove site and one grinding groove site with an associated rockshelter may be indirectly impacted if sediment controls are not implemented upstream. The remaining 47 sites and eight landscape features within the proposed continued underground mining area may be subject to various levels of impact following undermining and/or subsidence remediation works.

Management Strategy

The continuation of underground mining within the continued underground mining area has the potential to impact 49 (79%) Aboriginal archaeological sites and eight (47%) landscape features identified as having Aboriginal cultural heritage value within the proposed continued underground mining area (ATOAC – 1 April 2010 – requests it be noted that this is cumulatively 73% of sites and landscape features overall).

From an Aboriginal cultural heritage and an archaeological perspective, Aboriginal archaeological sites are a finite and irreplaceable resource that has already been heavily impacted by mining and other development in the broader Hunter Valley. Thus DECCW requires proposals for site damage/destruction to be accompanied by appropriate mitigation (site salvage and/or management) and balanced by site and/or other conservation offset measures. Therefore, the management options considered spanned conservation, conservation offsets and impact mitigation (for details refer to **Section 8.0**).

It is noted that the registered Aboriginal stakeholders voiced their concern with having to consider endorsing damage to any of the landscape features and Aboriginal archaeological sites within the proposed continued underground mining area and the legacy this left for their descendants and the lack of respect they felt this showed for the ancestral Awabakal people (refer to **Section 8.1**). In considering management options for the landscape features of Aboriginal cultural value and the Aboriginal archaeological sites, ADTOAC and ATOAC identified that it was not culturally appropriate for them, as custodians of Aboriginal cultural heritage for this area, to endorse any impacts that may result in damage to the landscape features of Aboriginal cultural value or the Aboriginal archaeological sites within the continued underground mining area. Thus 'no impact' and 'total conservation' was the preferred management option from the perspective of these registered Aboriginal stakeholders. CCC supported the ADTOAC and ATOAC recommendations (refer to **Appendix J**).

Similarly, ALALC identified that as the organisation with the 'responsibility' for 'the ongoing protection and conservation of the Aboriginal Culture and Heritage' within their Land Council area, that they were 'strongly opposed to the proposed underground mining and other impacts associated with this project' (ALALC correspondence dated 18 June 2010 – refer to **Appendix B**). KLALC stated that the proposed continued underground mining area was very important culturally and that the KLALC wanted 'the sites and places up there looked after properly so that future generations can visit the sites and learn more about the Aboriginal past of this area' (refer to **Section 8.1**).

Having noted that total conservation of all sites and landscape features of Aboriginal cultural value was the desired outcome of all registered Aboriginal stakeholders, ADTOAC, ATOAC, ALALC, KLALC and CCC provided comments on the management options they felt were the least objectionable if mining was to proceed and no impact/total conservation was not possible (refer to **Section 8.1**). It is further noted that ADTOAC and ATOAC are not saying that underground mining should not go ahead, but that if it does go ahead, they request it be

undertaken in a way that allows the landscape features of Aboriginal cultural value and the Aboriginal archaeological sites to remain undamaged.

The necessity for this assessment to consider Intergenerational Equity was outlined as part of the DECCW's requirements for the Project (correspondence dated 11 November 2009). The final management strategy has been prepared taking into account the need for the project outcomes to demonstrate Intergenerational Equity (for details refer to **Section 8.6**). As noted above, during the working draft report consultation period, it was noted that the requirements for meeting Intergenerational Equity placed WWC in the position where the feasibility of the continued underground mining project was put in doubt due to a lack of certainty in relation to approval for undermining one of the sites (Diega Creek Grinding Grooves 1). In order to address this lack of certainty and to address the requirements of Intergenerational Equity, WWC committed to setting aside for protection another five sets of grinding grooves in the Burkes Creek catchment to act as an offset for any potential damage from undermining of the Diega Creek Grinding Grooves 1 site (for details refer to **Section 8.7**). The registered Aboriginal stakeholders, however, did not assess that this was an appropriate offset. In light of the Aboriginal stakeholder comments WWC do not propose to utilise the management option of protecting the Burkes Creek sites but would like to retain the option to conserve the Burkes Creek area for future assessment if deemed appropriate by the registered Aboriginal stakeholders, DECCW and DoP.

Landscape Features of Aboriginal Cultural Value

Six principal management outcomes are included in the strategy for the management of the landscape features of cultural value. WWC has committed to:

- modification of the mine plan to protect the stone arch and one rockshelter site in the Bangalow Creek catchment and two rockshelter sites in the Cockle Creek catchment;
- following subsidence the inspection of the second wet soak feature recorded in the Diega Creek catchment and the infilling of any cracks caused by subsidence with imported fill and if required and feasible, erosion control works upslope to prevent infilling of the wet soak if subsidence results in any slope destabilisation;
- following subsidence the collection of loose fragments of clay pigment (if any) from the pigment source identified by the registered Aboriginal stakeholders in the upper tributary system of Bangalow Creek;
- prior to subsidence two stone cairns/stacks in the Bangalow Creek catchment are photographed from each side. Following undermining the replacement of any stones dislodged during subsidence by the registered Aboriginal stakeholders using the photographs as a reference, and the infilling of any cracks caused by subsidence with imported fill;
- following subsidence the inspection of the boulder identified as 'Kangaroo Rock' and the infilling of any cracks in the topsoil caused by subsidence with imported fill; and
- following subsidence the inspection of the five known rockshelters (not recorded as Aboriginal archaeological sites) within the proposed continued underground mining area and repairs to the roof, walls and floor in a culturally appropriate manner (where necessary, safe and feasible).

Following undermining, information will be recorded in relation to the impacts of subsidence on the various landscape features. This information will be used to inform future underground mining projects. The details of how this information will be recorded/reported are discussed in **Section 9.3.3**).

In relation to the six principal management outcomes, ADTOAC, ATOAC, ALALC, KLALC and CCC have indicated that they do not endorse any impacts to the landscape features of Aboriginal cultural value within the proposed continued underground mining area. Therefore they applaud WWC for modifying its mine plan to avoid impact to the stone arch and two rockshelters in the Cockle Creek catchment. Having indicated that it is not culturally appropriate to endorse any impact that may damage the identified landscape features of cultural value, the registered Aboriginal stakeholders have indicated that if Project Approval is obtained by WWC they would support the remaining five management outcomes in the dot points listed above as these are the least objectionable to them.

Aboriginal Archaeological Sites

Seven principal management outcomes are included in the strategy for the management of Aboriginal archaeological sites within the proposed continued underground mining area if longwall mining is approved (these are detailed in **Table 9.1**). It is recommended that the management strategy be implemented as a staged process as longwall mining progresses and in compliance with an ACHMP prepared in consultation with the relevant registered Aboriginal stakeholders, NPWS/DECCW and approved by DoP (refer to **Appendix H**).

The management outcomes proposed for Aboriginal archaeological sites are as follows (for site locations colour-coded by their proposed management outcome refer to **Figure 9.1**). The conservation offsets mentioned are detailed in **Section 9.3**.

WWC has committed to;

- modification of the mine plan to protect the Palmers Creek 1 Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the Western Domain 5 (#38-4-0993 - wet soak with artefact scatter site);
- modification of the mine plan to lessen the probability of impact to the Palmers Creek Grinding Grooves 3 site. AND mitigation of impacts due to subsidence (if any);
- prior to undermining of the Diega Creek Grinding Grooves 1 site to monitor the impacts of subsidence on the Diega Creek Grinding Grooves 2 to 6 sites and if more than 50% of these sites are cracked following subsidence to revise the management strategy in relation to Diega Creek Grinding Grooves 1;
- prior to undermining the manual excavation of 30% of the deposit from the Cockle Creek 1 Rockshelter with Artefacts and PAD and the propping of the roof of the rockshelter (if safe and feasible); and following subsidence repairs to any cracks in the walls, floor and roof (if necessary safe and feasible) and the return of any excavated material (if safe and feasible);
- prior to undermining the preparation of a photographic record and scale drawing of the two stone arrangement sites. Following undermining the inspection of the stone arrangements and if any movement of stones has been caused by subsidence, the registered Aboriginal stakeholders to replace the stones in their original arrangement. Any remediation works in the area to consist of infilling cracks in the topsoil with imported fill to avoid further site impact;
- prior to undermining the preparation of a photographic record and scale drawing of three scarred tree sites. Following undermining the inspection of the three Aboriginal scarred trees and the infilling of any cracks in the topsoil caused by subsidence with imported fill; and

- the provision of offsets for potential loss of Aboriginal cultural and archaeological values that may arise due to subsidence within the proposed continued underground mining impact area (refer to **Section 9.3**); AND if required following subsidence, the mitigation of any subsidence impacts using protocols and procedures detailed in an ACHMP prepared in consultation with the relevant registered Aboriginal stakeholders and the DECCW and as described in **Table 9.1**).

In relation to the seven principal management outcomes, ADTOAC, ATOAC, ALALC, KLALC and CCC have indicated that they do not endorse any impacts to the Aboriginal archaeological sites within the proposed continued underground mining area. Therefore they applaud WWC for modifying its mine plan to avoid impact to Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the Western Domain 5 (#38-4- 0993 - wet soak with artefact scatter site). Having indicated that it is not culturally appropriate to endorse any impact that may damage the Aboriginal archaeological sites, ADTOAC, ATOAC, ALALC, KLALC and CCC have indicated that if Project Approval is obtained by WWC they would support the remaining six management outcomes in the dot points listed above as these are the least objectionable to them.

Conservation Offset Strategy

WWC proposes a multi-faceted approach to providing a conservation offset strategy for its project. **Sections 9.3.1 to 9.3.5** outline the conservation offsets proposed by WWC as part of its overall management strategy which aims to meet the requirements of Intergenerational Equity and offset any loss of Aboriginal cultural heritage and archaeological values that may arise as an outcome of subsidence. The site and landscape feature locations are shown on **Figures 9.1 and 9.2**.

Mine Plan Modifications

WWC has committed to modifying its mine plans to avoid impact to the Palmers Creek 1 (#38-4-1007) and Palmers Creek 2 Grinding Groove sites and the Western Domain 5 (#38-4-0993 - wet soak with artefact scatter site). The mine modifications are proposed in recognition of the Aboriginal cultural value and archaeological significance of these sites.

The mine plan has also been modified to reduce the potential impact of subsidence on the Palmers Creek 3 Grinding Groove site from >25% to 5 to 15% probability of cracking in recognition of its Aboriginal cultural value and archaeological significance.

WWC has committed to modifying its mine plans to avoid impact to the 'stone arch'. This mine plan modification is proposed in recognition of the Aboriginal cultural value of this landscape feature.

The mine plan modifications have also acted to protect three rockshelters (Rockshelters 1, 2 and 8) recorded as landscape features of high Aboriginal cultural value.

The mine plan modifications proposed will sterilise 2.04 Mt of coal resource. This has a current economic value of \$150 million.

Following ongoing consultation with the registered Aboriginal stakeholders during the working draft and final draft report process it was assessed that WWC was not meeting the requirements of Intergenerational Equity in relation to one of the grinding groove sites (Diega Creek grinding Grooves 1). In order to address this inequity WWC also committed to protecting six additional grinding groove sites (Burkes Creek Grinding Groove 1, #38-4-0607, #38-4-0608; #38-4-0622, #38-4-0636 and #38-4-0599 Grinding Grooves and Possible Art) within ML 1451 from any future mining impacts as an offset for the potential loss of Aboriginal cultural and archaeological values associated with the undermining of Diega Creek Grinding

Grooves 1. In protecting these sites WWC has also afforded protection to a newly recorded scarred tree (Burkes Creek ST1). However, this proposed offset has been rejected by the registered Aboriginal stakeholders (refer to **Section 8.7** and **Appendix K**). If longwall mining is approved the registered Aboriginal stakeholders have requested the initial management option put forward in the working draft report be implemented (refer to **Section 9.3.3** for details).

Funding for Management of Cultural Heritage in SSCA

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts within the proposed continued underground mining area, WWC has committed to providing \$200,000 over the life of the proposed continued underground mine project to assist with the management of Aboriginal cultural and archaeological sites/values within the SSCA.

WWC will set aside the \$200,000 prior to mining commencing and will administer the funds. The funds will be allocated on a project basis. All projects will be undertaken in consultation with the relevant registered Aboriginal stakeholders and the NPWS/DECCW.

Funding for Ongoing Monitoring/Reporting of Subsidence Impacts

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts within the proposed continued underground mining area, WWC has committed to fund a program of monitoring and reporting of subsidence impacts on landscape features of Aboriginal cultural value and Aboriginal archaeological sites recorded within the proposed continued underground mining area.

It is proposed that following the cessation of subsidence related to each longwall WWC will fund an inspection of the subsided sites/landscape features of Aboriginal cultural heritage value in order to collect a detailed database on exactly how each of the sites is impacted. The inspection and reporting will be undertaken by the relevant registered Aboriginal stakeholders and a suitably qualified archaeologist. The purpose of the monitoring is threefold. Initially it is to observe:

- What percentage of the sites do/do not crack?
- What is the level and nature of the impact?
- How does this relate to the location of the site relative to longwalls/chain pillars and their situation (e.g. on a slope, on a sandstone bench, within a sandstone creek bed, in a cliffline, pre-existing cracking and jointing)?
- Does this information allow refinement of the predicted impacts and therefore management of subsidence on the sites within the proposed continued underground mining area?
- If so, does this information allow the revision of the management strategy for the remainder of the grinding groove sites for which subsidence is proposed?

The second aim of the monitoring is to provide a more detailed database for use for future mining assessments and to monitor the success of remediation works (where required) on all site types within the proposed continued underground mining area. This level of recording is rarely undertaken in relation to Aboriginal archaeological sites and landscape features of Aboriginal cultural value and will be extremely informative to WWC, registered Aboriginal stakeholders, archaeologists, NPWS/DECCW and DoP for undertaking and evaluating future assessments. A database of this nature would be an extremely valuable resource.

The third aim is to ensure compliance with the various aspects of the management strategy that relate to monitoring either before or after subsidence. In this regard it is proposed to record the:

- impacts of subsidence (if any);
- requirements for remediation (if any);
- nature and extent of the remediation works;
- suitability of the remediation works;
- success of remediation works; and
- project approval compliance.

It is proposed that full pictorial records will be prepared for each landscape feature/site to inform the reporting process for the DECCW and DoP.

One aspect of the monitoring process will be to ascertain if more than 50% of the Diega Creek Grinding Grooves 2 to 6 sites have been impacted by cracking due to subsidence. This monitoring will be undertaken prior to any longwall mining that may impact the Diega Creek Grinding Grooves 1 site. If more than 50% (3 or more) of these sites crack WWC has committed to revising its management strategy in consultation with the registered Aboriginal stakeholders and the NPWS/DECCW. Revisions to the management strategy may include conservation of the site or to further survey to locate other sites that could be conserved as an appropriate offset for any potential damage to Diega Creek Grinding Grooves 1.

Funding for Further Survey of the SSCA

For WWC to be able to meet the requirements of Intergenerational Equity without further modifications to the mine plan, WWC must demonstrate that Aboriginal archaeological sites of equal cultural heritage and archaeological significance and research potential to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites exist within the broader SSCA and outside of mine leases and that these sites can be managed in a culturally appropriate way that will ensure their long-term conservation and availability for teaching purposes to present and future generations of Awabakal people and Aboriginal people that live in, and/or visit the area. In this regard WWC has committed to funding a program of survey within the SSCA in consultation with the registered Aboriginal stakeholders and the NPWS/DECCW. The information recorded during the survey will be provided to the NPWS/DECCW to assist in the preparation of the POM for the SSCA.

It is proposed that:

- during the approval process a meeting will be arranged by WWC with NPWS/DECCW, in consultation with ADTOAC, ALALC, ATOAC, CCC, NSWALC (an archaeologist may be included in this meeting if thought appropriate by WWC, ADTOAC, ALALC, ATOAC, CCC and NSWALC) to discuss:
 - WWC setting up a fund which they will administer for survey within the SSCA (outside the proposed continued underground mining area and outside ML areas);
 - the nature of the survey strategy; and
 - the requirements of the POM being prepared by the NPWS/DECCW for the SSCA so that the requisite information can be recorded during the survey;

- the survey will include at least 20 days of survey and recording of sites and landscape values/resources within the SSCA by the relevant registered Aboriginal stakeholders and an archaeologist (the breakdown of this time between the ALALC and KLALC boundaries will be subject to consultation between the Aboriginal stakeholder groups and WWC);
- funding will also be provided for the preparation and production of site cards (including the production of maps, plans, photographs); and
- following the completion of the survey and the compilation of the site cards, additional funding will be provided to commission a suitably qualified person to assist WWC to prepare a statement, in consultation with the relevant registered Aboriginal stakeholders, for provision to DoP and NPWS/DECCW in relation to the suitability (in terms of their Aboriginal cultural and archaeological significance and conservation value) of the sites located outside MLs and within the SSCA as an offset (in terms of Intergenerational Equity) for the impact predicted from subsidence to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves 3 sites.

WWC will commit to revising the management strategy for the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites if it cannot be demonstrated that:

- there are suitable sites outside the proposed continued underground mining area and outside MLs in the SSCA that can be managed/conserved into the future to meet the requirements of Intergenerational Equity for all or some of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites (this will be site specific and depend on the outcomes of the survey and further consultation with NPWS/DECCW).

The revisions to the management strategy may include further survey or alternative offsets assessed as appropriate from an Aboriginal cultural and archaeological perspective and endorsed by DECCW and DoP.

While the strategy above proposes a start date for the survey within 24 months of site impact, WWC may commence work on the strategy at an earlier date if it would prefer to know the outcome of the survey sooner and to obtain more certainty for the proposed continued underground mining project.

Additional Conservation Offsets

Each of the registered Aboriginal stakeholder groups has requested an additional cultural heritage conservation offset package which they assess as necessary for WWC to balance the requirements of Intergenerational Equity.

As some groups requested that the supply of details related to their additional offset requests be restricted to the Aboriginal stakeholders, WWC, NPWS/DECCW and DoP, the information has been included in **Appendix L** which will not be available for public review.

As part of its overall conservation offset strategy WWC has committed to the provision of \$25,000 to four of the registered Aboriginal stakeholders and \$10,000 to a fifth Aboriginal stakeholder as an additional offset for specific cultural heritage projects (refer to **Appendix L** for additional offsets proposed and WWC's commitments).

Aboriginal Cultural Heritage Management Plan (ACHMP)

WWC will prepare an ACHMP for the project that is consistent with the Aboriginal cultural and archaeological management commitments made in this report. These management commitments should form part of the Statement of Commitments arising from the environmental assessment process. The ACHMP will provide detailed management

strategies for all identified Aboriginal archaeological sites and landscape features of Aboriginal cultural value located within the proposed continued underground mining area.

The ACHMP will also review and revise as required/where appropriate, Aboriginal heritage management protocols from previous consents and approvals, to provide WWC with a single, consolidated framework for managing Aboriginal cultural heritage (for details please refer to **Appendix H**). The ACHMP will also clearly identify the responsibilities of all parties involved; WWC, registered Aboriginal stakeholders, archaeologists, NPWS/DECCW; and designate timeframes for required Aboriginal heritage management works.

The ACHMP will be in operation throughout the life of the proposed continued underground mining project. The aim of the ACHMP is to ensure WWC meet the requirements of the Project Approval which it is proposed should include a request for:

- details of the proposed implementation of, and methodology for, the conservation offset strategy;
- a detailed salvage program for Aboriginal archaeological sites within the proposed continued underground mining area including isolated finds, artefact scatters (if subsidence remediation works are required in the site areas) and the Cockle Creek Rockshelter with Artefacts and PAD (refer to **Appendix I** for a detailed Research Design and Methodology);
- a detailed description of the mitigation measures that would be undertaken for all Aboriginal archaeological sites and landscape features of Aboriginal cultural value within the proposed continued underground mining area prior to and/or following subsidence;
- a detailed description of the measures that would be implemented to protect Aboriginal archaeological sites and landscape features of Aboriginal cultural value for the life of the project;
- a detailed methodology for inspection of locations proposed for surface ventilation infrastructure construction and future exploration boreholes (for further details refer to **Section 9.6**);
- a description of the measures that would be implemented if any new Aboriginal sites/artefacts or skeletal remains are discovered during works associated with the Project;
- the provision of Aboriginal cultural awareness training for WWC personnel and for contractors as part of the induction process; and
- a protocol for the ongoing consultation and involvement of the Aboriginal stakeholder groups and NPWS/DECCW in the conservation and management of Aboriginal cultural heritage within the proposed continued underground mining area.

Appendix H provides more detailed descriptions of requirements proposed for the ACHMP.

Endorsement of the proposal for an ACHMP has been provided by the relevant registered Aboriginal stakeholders. Their comments are provided below.

Care of Salvaged Artefacts

The following protocol for 'care' is based on a compromise between the competing wishes of the registered Aboriginal stakeholders and taking into account the archaeological requirements.

Any artefacts collected/salvaged will be subject to a full attribute analysis prior to being returned to their specific site locations following completion of subsidence remediation works. Where it is possible to return the artefacts to the site immediately, they will be analysed in the field and returned on the same day. Where works cannot be undertaken immediately they will be in the care of the archaeological consultant commissioned to assist the registered Aboriginal stakeholders with the salvage program. Following completion of remediation works the artefacts will be returned to their specific site locations and placed in an area where they will be safe from further impact. Revised site cards will be provided to the DECCW. This will happen on an ongoing basis as mining progresses.

Endorsement of the proposal for care of the artefacts has been provided by the majority of the relevant registered Aboriginal stakeholders. Comments provided by the registered Aboriginal stakeholders are included in **Section 9.5**.

Future Ventilation Infrastructure and Exploration Boreholes

It may be necessary for ventilation infrastructure to be built within the proposed continued underground mining area once mining has commenced. It is also probable that there will be a need for further exploration boreholes, even during the project approval process. It is proposed that once the areas proposed for impact have been identified that they will be inspected by the registered Aboriginal stakeholders and an archaeologist and that they will be situated whenever possible outside culturally sensitive areas/sites. If this is not possible a management outcome will be undertaken in compliance with protocols and procedures set out in the ACHMP to be prepared in consultation with the NPWS/DECCW and the registered Aboriginal stakeholders (refer to **Section 9.4** and **Appendix H**). Based on comments provided by the relevant registered Aboriginal stakeholders, it is noted that it may be necessary for WWC to undertake site salvage and/or provide an additional offset if a site of high Aboriginal cultural and archaeological significance/research potential cannot be avoided when it becomes necessary to construct future ventilation infrastructure or drill exploration boreholes (refer to **Section 8.5**).

Timeframes for Implementation of Management Strategy

Table 3 identifies the timeframes related to the implementation of the management recommendations that make up the management strategy. The table is generalised in nature as a detailed timeframe for each of the tasks required will be prepared in consultation with the registered Aboriginal stakeholders, the DECCW and the DoP as part of the ACHMP (refer to **Appendix H**).

Table 3 - Timeframes for Implementation of the Management Strategy

Task	Timeframe
Ongoing discussions with NPWS/DECCW and the registered Aboriginal stakeholders in relation to funding for the survey within the SSCA (for details refer to Section 9.3.4).	During the EA approval process.
Preparation of the ACHMP for the proposed continued underground mining area (for details refer to Section 9.4).	The ACHMP must be prepared in compliance with the conditions of the Project Approval. Thus, while it can be commenced prior to the receipt of Development Approval it cannot be completed until all conditions of Approval are known. The ACHMP must be completed and approved by DoP prior to any subsidence that may impact an Aboriginal archaeological site within the continued underground mining area that is not covered by an existing SMP approval.
WWC to provide \$200,000 funding to assist with management of Aboriginal cultural and archaeological sites/values within the SSCA (for details refer to Section 9.3.2).	The money will be set aside by WWC within 12 months of Project Approval. The money will be administered by WWC and apportioned on a project related basis over the life of the proposed continued underground mining project.
Undertake all tasks required under the ACHMP that must be performed prior to impact by longwall extraction. Including further detailed recording of the Cockle Creek 1 and Diega Creek 1 Stone Arrangement sites and the Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4 scarred tree sites (for an outline of what these tasks are proposed to entail refer to Appendices H and I).	Following Project Approval and endorsement of the ACHMP by the NPWS/DECCW and DoP and prior to undermining that may impact the Cockle Creek 1 and Diega Creek 1 Stone Arrangement sites and the Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4 scarred tree sites.
Undertake all tasks required under the ACHMP that must be performed after impact by subsidence related to longwall extraction. Including surface collection of any artefact scatters and isolated finds in areas where subsidence remediation is required; repair of topsoil cracking, repair of rockshelter cracking (where necessary, safe and feasible), repair of grinding groove cracking, repair of stone arrangements and stone cairns/stacks and repair of the second wet soak (if required).	Following endorsement of the ACHMP by the NPWS/DECCW and DoP and on an ongoing basis as longwall extraction proceeds.
Following the cessation of all subsidence impacts related to each longwall the relevant registered Aboriginal stakeholders and an archaeologist will inspect all of the previously recorded Aboriginal archaeological sites and landscape features of cultural heritage value within the subsidence impact area. The outcomes of subsidence and the success of remediation works on the sites/landscape features will be recorded and reported to the DECCW. Where necessary revised site cards will be provided to the DECCW (for details refer to Section 9.3.3).	At the completion of undermining of each longwall and when subsidence related to that longwall has ceased and remediation works (where necessary) have been completed.

Table 3 - Timeframes for Implementation of the Management Strategy (cont)

Task	Timeframe
Inspect Diega Creek Grinding Grooves 2, 3, 4, 5 and 6. Based on the percentage of these sites that crack, undertake consultation with the registered Aboriginal stakeholders and the NPWS/DECCW in relation to the management strategy for Diega Creek Grinding Grooves 1 (refer to Section 9.3.3).	Following the completion of Longwall 48 and the cessation of subsidence in the area of Diega Creek Grinding Grooves 4 and prior to any potential for impact on Diega Creek Grinding Grooves 1.
Undertake survey within the SSCA (for details refer to Section 9.3.4).	At least 12 months prior to impact by subsidence on the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461, grinding groove sites.
Following survey of the SSCA, prepare a statement for provision to DoP and NPWS/DECCW in relation to the suitability of the ongoing conservation of the sites located outside the proposed continued underground mining area and within the SSCA to balance (in terms of Intergenerational Equity) the damage predicted from subsidence/subsidence remediation to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461. This statement may recommend that subsidence of some/all of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites can go ahead or that the management strategy in relation to these sites will need further revision to reach an outcome that is acceptable from an Aboriginal cultural and archaeological perspective and to NPWS/DECCW and DoP.	At least 12 months prior to impact by subsidence on the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461, grinding groove sites and following consultation with NPWS/DECCW and the registered Aboriginal stakeholders in relation to the management of these sites for their long-term conservation.
Revise ACHMP to incorporate final management strategy for Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites. Obtain approval of revised ACHMP from DoP.	Following approval of final management strategy/strategies for Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites and prior to any impact to any of the sites from subsidence.
Undertake the salvage program for the Cockle Creek Rockshelter with Artefacts and PAD using the research design and methodology detailed in Appendix I and in compliance with the ACHMP as presented in Appendix H .	Following Project Approval and endorsement of the ACHMP by the NPWS/DECCW and DoP. The salvage program for the Cockle Creek Rockshelter with Artefacts and PAD should not be implemented until 12 months prior to impact by removal of LW42.
Undertake inspections of locations proposed for ventilation infrastructure to be built within the proposed continued underground mining area once mining has commenced and for further exploration boreholes where necessary. Inspection to be undertaken by relevant registered Aboriginal stakeholders and an archaeologist in compliance with ACHMP.	On an ongoing basis throughout the life of the proposed continued underground mine project.

TABLE OF CONTENTS

1.0	Introduction	1.1
1.1	Sugarloaf State Conservation Area	1.1
1.2	Background and Overview of the West Wallsend Colliery Continued Operations Project.....	1.2
1.3	Potential Impacts of the Project.....	1.4
1.4	Intergenerational Equity	1.4
1.5	Modifications to the Mine Plan	1.4
1.6	Statutory and Policy Framework.....	1.5
1.6.1	EP&A Act (1979)	1.5
1.6.2	NPW Act (1974).....	1.6
1.6.3	DECCW Interim Community Consultation Requirements for Applicants (2004)	1.7
1.6.4	Reporting Requirements.....	1.7
1.7	Report Authorship.....	1.8
1.8	Structure of this Report	1.8
2.0	Aboriginal Stakeholder and Agency Consultation and Participation.....	2.1
2.1	The DECCW ICCR Process	2.1
2.2	Consultation Regarding the Survey Strategy	2.2
2.3	Aboriginal Stakeholder Consultation During Field Survey.....	2.2
2.4	Consultation Regarding the Mine Plan for the Underground Mining Area.....	2.2
2.5	Consultation Regarding the Draft Archaeological Assessment and Aboriginal Significance Assessment	2.3
2.6	National Native Title Tribunal Results	2.4
2.7	DECCW Consultation	2.4
3.0	Aboriginal Cultural, Physical, Ethnographic and Archaeological Context	3.1
3.1	Aboriginal Cultural Knowledge and Values – Sugarloaf Range and Environs.....	3.1
3.1.1	Awabakal Descendants Traditional Owners Aboriginal Corporation	3.1
3.1.2	Awabakal Traditional Owners Aboriginal Corporation.....	3.2
3.1.3	Awabakal Local Aboriginal Land Council	3.2

3.1.4	Koompahtoo Local Aboriginal Land Council	3.4
3.1.5	Cacatua Cultural Consultants.....	3.5
3.2	Previously Recorded Cultural Value Assessments.....	3.5
3.3	Summary Aboriginal Cultural Values	3.6
3.4	Physical Context of the Proposed Continued Underground Mining Area.....	3.7
3.4.1	Sugarloaf State Conservation Area.....	3.7
3.4.2	Topography and Hydrology	3.8
3.4.3	Geology and Soils	3.9
3.4.4	Climate.....	3.10
3.4.5	Flora and Fauna	3.10
3.4.6	Historic Land-Use	3.14
3.5	Implications of the Physical Context of the Proposed Continued Underground Mining Area for Aboriginal Site Location.....	3.15
3.6	Ethnographic and Archaeological Context.....	3.16
3.6.1	Ethnographic Context of the Proposed Continued Underground Mining Area	3.16
3.6.2	Previously Recorded Aboriginal Sites	3.21
3.7	Previous Aboriginal Archaeological Assessments.....	3.25
3.7.1	National Highway (F3 Freeway) - Lough 1981, Donlan and Brayshaw 1986.....	3.25
3.7.2	Transgrid - Bowdler and Gollan and Bowdler and Happ 1982.....	3.26
3.7.3	Cameron Park - Steele 1993 and Mills 1999.....	3.26
3.7.4	Newstan Colliery - Umwelt 1998 and 2004d	3.26
3.7.5	Hunter Expressway - Brayshaw 1994, 2001, Umwelt 2003a, 2003b, 2006e, 2006f, 2010.....	3.27
3.7.6	Tasman Underground Mine (Umwelt 2002).....	3.31
3.7.7	Further Archaeological Assessment for West Wallsend Colliery (Umwelt 2005)	3.32
3.7.8	Western Domain within the Proposed Continued Underground Mining Area (Umwelt 2006a).....	3.33
3.7.9	Northern Domain (Umwelt 2006b).....	3.34
3.7.10	Proposed Easement, Tasman Lease, West Wallsend (Umwelt 2006c)	3.34
3.7.11	Southern Domain within the Proposed Continued Underground Mining Area (Umwelt 2006d).....	3.35
3.7.12	Geomorphic Investigation of the 'Wet Soak' Associated with Artefacts Scatter WD5, within the Proposed Continued Underground Mining Area (Umwelt 2008)	3.35
3.7.13	Western Domain Salvage, within the Proposed Continued Underground Mining Area (Umwelt in prep.).....	3.35
3.7.14	Conservation Status of Sites	3.36
3.8	Summary of Previous Aboriginal Archaeological Investigations	3.38

3.9	The Predictive Model.....	3.39
3.9.1	Implications of the Aboriginal Cultural Values, Physical and Ethnographic and Archaeological Context of the Continued Underground Mining Area	3.39
3.9.2	Previously Proposed Models for Aboriginal Landscape Use and Site Location in the Sugarloaf Range Area	3.41
3.10	Predictive Model.....	3.43
4.0	Survey Methodology	4.1
4.1	Proposed Methodology.....	4.1
5.0	Survey Results	5.1
5.1	Survey Coverage	5.1
5.2	Landscape Features of Aboriginal Cultural Value Recorded During the Survey.....	5.3
5.2.1	Spring	5.3
5.2.2	Wet Soak (2).....	5.4
5.2.3	Pigment in Bangalow Creek	5.5
5.2.4	Stone Arch	5.5
5.2.5	Stone Cairns/Stacks	5.6
5.2.6	'Kangaroo Rock'	5.6
5.2.7	Rockshelters	5.6
5.3	Aboriginal Archaeological Sites Recorded During the Survey	5.7
5.3.1	Potential for Archaeological Deposits.....	5.7
5.3.2	Grinding Groove Sites	5.8
5.3.3	Sites Containing Stone Artefacts.....	5.40
5.3.4	Cockle Creek Rockshelter with Artefacts and PAD.....	5.50
5.3.5	Stone Arrangements.....	5.51
5.3.6	Scarred Trees	5.52
5.4	Discussion - Sites Located During the Survey	5.53
5.4.1	Restriction of Access	5.56
5.5	Review - Objectives of the Survey Strategy	5.56
5.6	Review of the Predictive Model.....	5.58
6.0	Significance Assessment	6.1
6.1	Aboriginal Cultural Significance	6.1
6.1.1	Cultural Significance of Aboriginal Archaeological Sites within the Proposed Continued Underground Mining Area	6.4
6.1.2	Landscape Features of Cultural Significance within the Proposed Continued Underground Mining Area.....	6.14

6.2	Archaeological Significance.....	6.15
6.2.1	Assessment Criteria	6.15
6.2.2	Sites of High Archaeological Significance	6.29
6.2.3	Sites of Moderate to High Archaeological Significance.....	6.30
6.2.4	Sites of Moderate Archaeological Significance	6.31
6.2.5	Sites of Low to Moderate Archaeological Significance	6.32
6.2.6	Sites of Low Archaeological Significance.....	6.33
6.2.7	Archaeological Significance of the Landforms	6.33
6.2.8	Archaeological Research Potential (Sites).....	6.34
6.2.9	Archaeological Research Potential of the proposed continued Underground Mining Area	6.35
7.0	Impact Assessment.....	7.1
7.1	Analysis of Potential Impacts to Sites/Predicted Loss of Aboriginal Cultural and Archaeological Value.....	7.2
7.2	Analysis of Potential Impacts to Landscape Features of Aboriginal Cultural Significance	7.23
7.3	Methods Available for Mitigation of Direct Impacts	7.26
8.0	Management Options	8.1
8.1	Registered Aboriginal Stakeholder Approach to Determining Management Options	8.2
8.2	Conservation Offset Strategy Options	8.5
8.2.1	Conservation - Mine Plan Modification.....	8.7
8.2.2	Funding for Management of Cultural Heritage in SSCA	8.9
8.2.3	Ongoing Monitoring/Reporting of Subsidence Impacts.....	8.10
8.2.4	Funding for Further Survey in the SSCA.....	8.13
8.2.5	Additional Offset Options.....	8.16
8.3	Impact without Mitigation	8.17
8.3.1	Aboriginal Stakeholder Comment on the Proposed Management Option for Impact without Mitigation.....	8.17
8.4	Mitigated Impact	8.18
8.4.1	Grinding Groove Sites	8.18
8.4.2	Artefact Scatters and Isolated Finds	8.20
8.4.3	Scarred Trees.....	8.21
8.4.4	Stone Arrangements.....	8.22
8.4.5	Cockle Creek Rockshelter with Artefacts and PAD.....	8.24
8.4.6	Landscape Features of Aboriginal Cultural Significance.....	8.26
8.5	Future Ventilation Infrastructure and Exploration Boreholes	8.28
8.5.1	Aboriginal Stakeholder Comment on the Proposed Management Option for Future Ventilation Infrastructure and Exploration Boreholes	8.28

8.6	Do the Management Options Proposed Address Intergenerational Equity?	8.29
8.6.1	Definitions	8.30
8.6.2	Does the management approach proposed for the project give effect to these cultural concepts of Intergenerational Equity?	8.31
8.6.3	Aboriginal Stakeholder Comment on Intergenerational Equity	8.33
8.6.4	Summary Intergenerational Equity	8.35
8.7	Impacts of Intergenerational Equity Requirements on Mine Feasibility and Further Site Offsets	8.35
8.8	Request for Additional Offset Options	8.39
9.0	Management Strategy	9.1
9.1	Management Strategy for Aboriginal Archaeological Sites.....	9.1
9.1.1	Aboriginal Cultural Preferred Management Outcome	9.1
9.2	Landscape Features of Aboriginal Cultural Value.....	9.11
9.2.1	Aboriginal Cultural Preferred Management Outcome	9.12
9.3	Conservation Offset Strategy	9.15
9.3.1	Mine Plan Modifications.....	9.15
9.3.2	Funding for Management of Cultural Heritage in SSCA	9.16
9.3.3	Funding for Ongoing Monitoring/Reporting of Subsidence Impacts.....	9.16
9.3.4	Funding for Further Survey of the SSCA.....	9.17
9.3.5	Additional Conservation Offsets	9.19
9.4	Aboriginal Cultural Heritage Management Plan (ACHMP)	9.19
9.5	Care of Salvaged Artefacts	9.20
9.6	Future Ventilation Infrastructure and Exploration Boreholes	9.21
9.7	Timeframes for Implementation of Management Strategy.....	9.22
10.0	References	10.1

FIGURES

1.1	Location of West Wallsend Colliery	1.1
1.2	Continued Underground Mining Area and Adjoining Mine Leases	1.1
1.3	Modified Continued Underground Mining Area within Awabakal Traditional Lands	1.1
3.1	Topography of the Continued Underground Mining Area.....	3.8
3.2	Landform Elements within the Continued Underground Mining Area ..	3.8
3.3	Aboriginal people using fire to hunt kangaroos – Joseph Lycett c.1820.....	3.18
3.4	Previously Recorded Aboriginal Archaeological Sites	3.22
3.5	Previously Recorded Aboriginal Sites within the Continued Underground Mining Area and Environs	3.22
5.1	Survey Transects	5.1
5.2	Landscape Features of Aboriginal Cultural Value	5.3
5.3	New and Previously Located Aboriginal Archaeological Sites	5.4
5.4	New and Previously Recorded Grinding Groove Sites.....	5.8
5.5	New and Previously Recorded Sites with Stone Artefacts	5.40
5.6	Rockshelters and Stone Arrangements.....	5.50
5.7	Scarred Trees assessed by UTM	5.52
6.1	Aboriginal Cultural Site/Landscape Feature Significance	6.1
6.2	Archaeological Site Significance	6.1
6.3	Archaeological Landform Significance.....	6.33
7.1	Assessed Site Impacts	7.1
7.2	Assessed Aboriginal Cultural Feature Impact.....	7.1
8.1	Aboriginal and Archaeological Significance of Sites within ML 1451 Proposed for Protection from Mining as a Conservation Offset.....	8.35

9.1	Proposed Management Strategy of Aboriginal Archaeological Sites ...	9.2
9.2	Proposed Management Strategy of Landscape Features of Aboriginal Cultural Value	9.12

PLATES

1	The Sugarloaf Range – Eastern Fall including the Cockle Creek, Diega Creek and Palmers Creek Catchment.....	3.8
2	Sandstone platforms in the headwaters of Bangalow Creek.....	3.8
3	Example of the steep slopes on the eastern fall of the Sugarloaf Range.....	3.8
4	Spring identified as an Aboriginal cultural landscape feature of significance	5.3
5	Second wet soak identified as an Aboriginal cultural landscape feature of significance.....	5.4
6	Pigment Site in Bangalow Creek	5.5
7	Stone arch identified as an Aboriginal cultural landscape feature of significance	5.5
8a	Stone Cairns identified as an Aboriginal cultural landscape feature of significance.....	5.6
8b	Stone Cairns identified as an Aboriginal cultural landscape feature of significance.....	5.6
9	‘Kangaroo Rock’ identified as an Aboriginal cultural landscape feature of significance.....	5.6
10	An example of a rockshelter identified as an Aboriginal cultural landscape feature of significance (photograph courtesy of Dene Hawken)	5.6
11	Bangalow Creek Grinding Grooves 1.....	5.11
12	Bangalow Creek Grinding Grooves 2.....	5.12
13	Bangalow Creek Grinding Grooves 3.....	5.13
14	Bangalow Creek Grinding Grooves 4.....	5.14
15	Bangalow Creek Grinding Grooves 5.....	5.14

16	Bangalow Creek Grinding Grooves 5.....	5.14
17a	Bangalow Creek Grinding Grooves 6.....	5.17
17b	Bangalow Creek Grinding Grooves 6.....	5.17
18	Bangalow Creek Grinding Grooves 7.....	5.17
19	#38-4-0461 (photograph from DECCW site card)	5.18
20	#38-4-0462 Grinding Grooves	5.19
21	#38-4-0462 Rockshelter	5.20
22	Palmers Creek Grinding Grooves 1.....	5.21
23	Palmers Creek Grinding Grooves 1.....	5.21
24	Palmers Creek Grinding Grooves 2.....	5.23
25	Palmers Creek Grinding Grooves 2.....	5.23
26	Palmers Creek Grinding Grooves 3.....	5.25
27	Palmers Creek Grinding Grooves 3.....	5.25
28a	Diega Creek Grinding Grooves 1.....	5.26
28b	Diega Creek Grinding Grooves 1.....	5.26
28c	Diega Creek Grinding Grooves 1.....	5.26
29	Diega Creek Grinding Grooves 2.....	5.28
30	Diega Creek Grinding Grooves 3.....	5.29
31	Diega Creek Grinding Grooves 4.....	5.30
32	Diega Creek Grinding Grooves 5.....	5.30
33	Diega Creek Grinding Grooves 6.....	5.31
34	Cockle Creek Grinding Groove 1	5.32
35	Small rockshelter near Cockle Creek Grinding Groove 1	5.32
36	Cockle Creek Grinding Groove 2.....	5.32
37	Artefacts located in Cockle Creek Rockshelter.....	5.50

38	Cockle Creek Rockshelter with Artefact and PAD	5.50
39	Cockle Creek Scarred Tree 2	5.53
40	Diega Creek Scarred Tree 1	5.53
41	Diega Creek Scarred Tree 4, Scar 1.....	5.53
42	Diega Creek Scarred Tree 4, Scar 2.....	5.53

APPENDICES

A	Aboriginal Stakeholder Consultation Log
B	Aboriginal Stakeholder Correspondence
C	Native Title Register Search
D	Local and Regional Grinding Groove Site Data
E	Western Domain 5 Site Card
F	Scarred Tree Report
G	Excerpt from Subsidence Report
H	Aboriginal Cultural Heritage Management Plan
I	Research Design and Methodology
J	ATOAC and CCC Statements - Restricted Documentation
K	Details of Sites in Additional Offset (ML 1451)
L	Aboriginal Stakeholder Conservation Offset Requests – Restricted Documentation

1.0 Introduction

The area subject to the current development application is known as the West Wallsend Colliery Continued Operations Project area (hereafter the proposed continued underground mining area). The proposed continued underground mining area and its surrounds are within the Sugarloaf Range area and the traditional lands of the Awabakal people (Threlkeld in Gunson 1974) (refer to **Figure 1.1** and **Figure 1.2**). The Sugarloaf Range area is of great cultural heritage significance to the Awabakal people and Aboriginal people that have made the Country of the Awabakal people their home. The southern section of the proposed continued underground mining area is within the former Koombahtoo Local Aboriginal Land Council (KLALC⁶) boundary, while the central and northern sections are within the Awabakal Local Aboriginal Land Council boundary (ALALC) as shown on **Figure 1.2**. Statements of significance supplied by the registered Aboriginal stakeholders have been given primary recognition in the preface of this report. These statements relate the very high Aboriginal cultural significance of the Sugarloaf Range area to the Awabakal people and the Aboriginal people that make the Country of the Awabakal their home.

The proposed continued underground mining area is within the Local Government Areas of both the Lake Macquarie and Cessnock City Councils, but is mainly within the Lake Macquarie Local Government Area. The proposed continued underground mining area is located immediately west of Killingworth and Wakefield, north of Ryhope, and is dissected by the Sydney to Newcastle F3 Freeway (refer to **Figures 1.2** and **1.3**).

WWC is one of a number of active mining operations within the Newcastle Coalfields of New South Wales (refer to **Figure 1.1**). The Colliery is an underground mine located approximately 20 kilometres south-west of Newcastle. The underground coal mining operation at WWC targets the Borehole and West Borehole seams using the longwall extraction method. WWC is operated by Oceanic Coal Australia Limited (OCAL) on behalf of the Macquarie Coal Joint Venture (MCJV). WWC is the major joint venture participant of MCJV with 70% ownership. Other participants include Marubeni Coal Pty Ltd (17%), OCAL Macquarie (10%) and JFE Minerals (Aust) Pty Ltd (3%). Oceanic Coal Australia Limited, which also owns OCAL Macquarie Pty Ltd, is wholly-owned by Xstrata Coal (Australia) Pty Limited.

The Aboriginal cultural heritage and archaeological assessment presented in this report has been prepared as part of broader application under Part 3A of the *Environmental Planning & Assessment Act (1979)* (EP&A Act). Following cessation of its existing Part 5 Approval under the EP&A Act in December 2010, WWC will require development approval in relation to the proposed continued operation of underground mining at WWC.

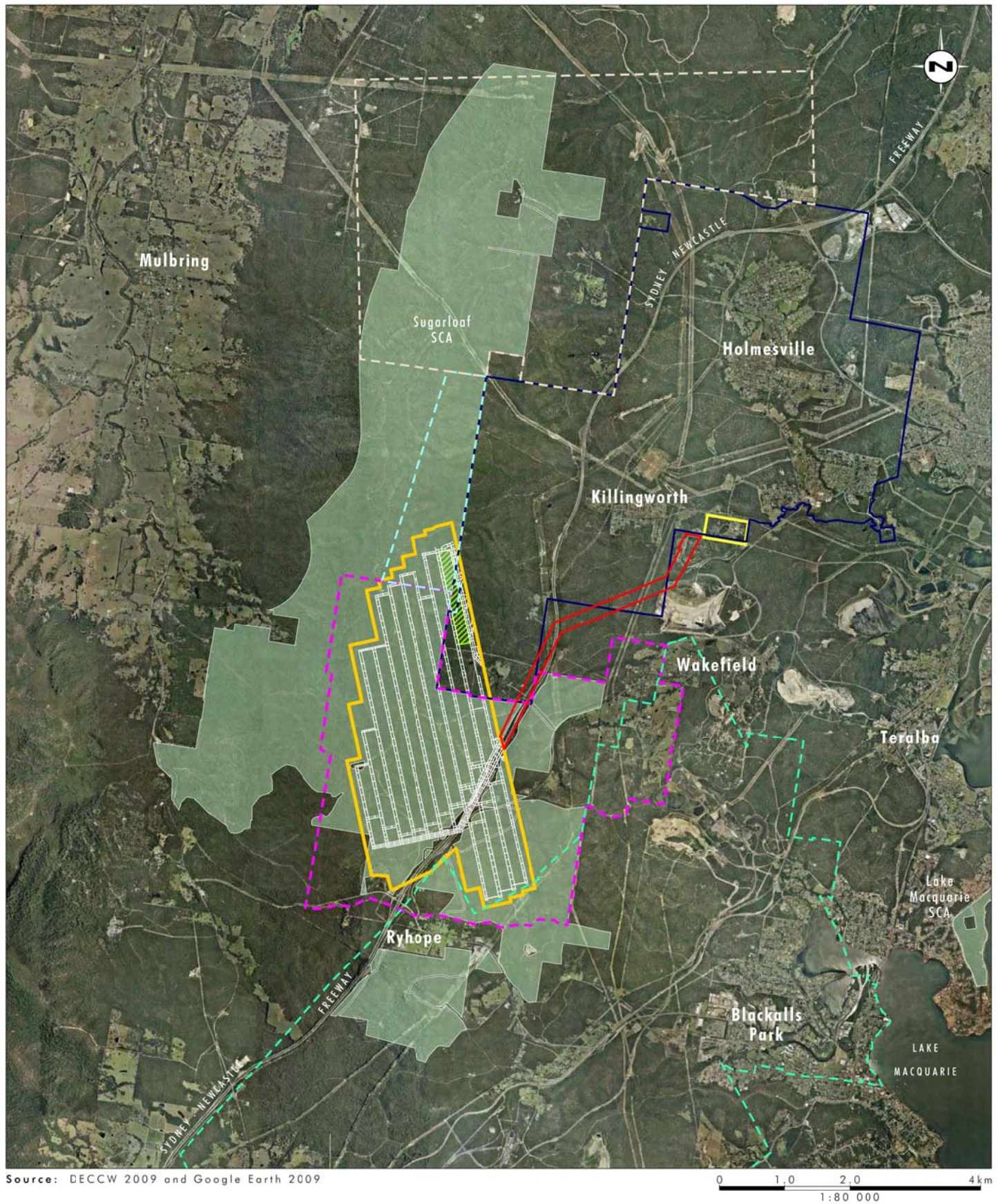
1.1 Sugarloaf State Conservation Area

The proposed continued underground mining area is approximately 1085 hectares in size. Approximately 933 hectares (86%) of the proposed continued underground mining area is within the Sugarloaf State Conservation Area (SSCA) which was reserved in July 2007 (for details refer to <http://www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N1106> and **Figure 1.2**). The SSCA is 3973 hectares in area and incorporates 2139 hectares of the former Awaba State Forest, 1428 hectares of the former Heaton State Forest and 370 hectares of other lands (for further details refer to <http://www.austlii.edu.au/au/legis/nsw/bill/npehrrb206578>). Underground mining is not precluded by reservation of lands as an SCA, however, mining in the SCA must be undertaken 'having regard to the conservation of the natural and cultural values of the state

⁶ KLALC was recently closed shortly after provision of comment on the working draft of this report.



FIGURE 1.1
Location of West Wallsend Colliery



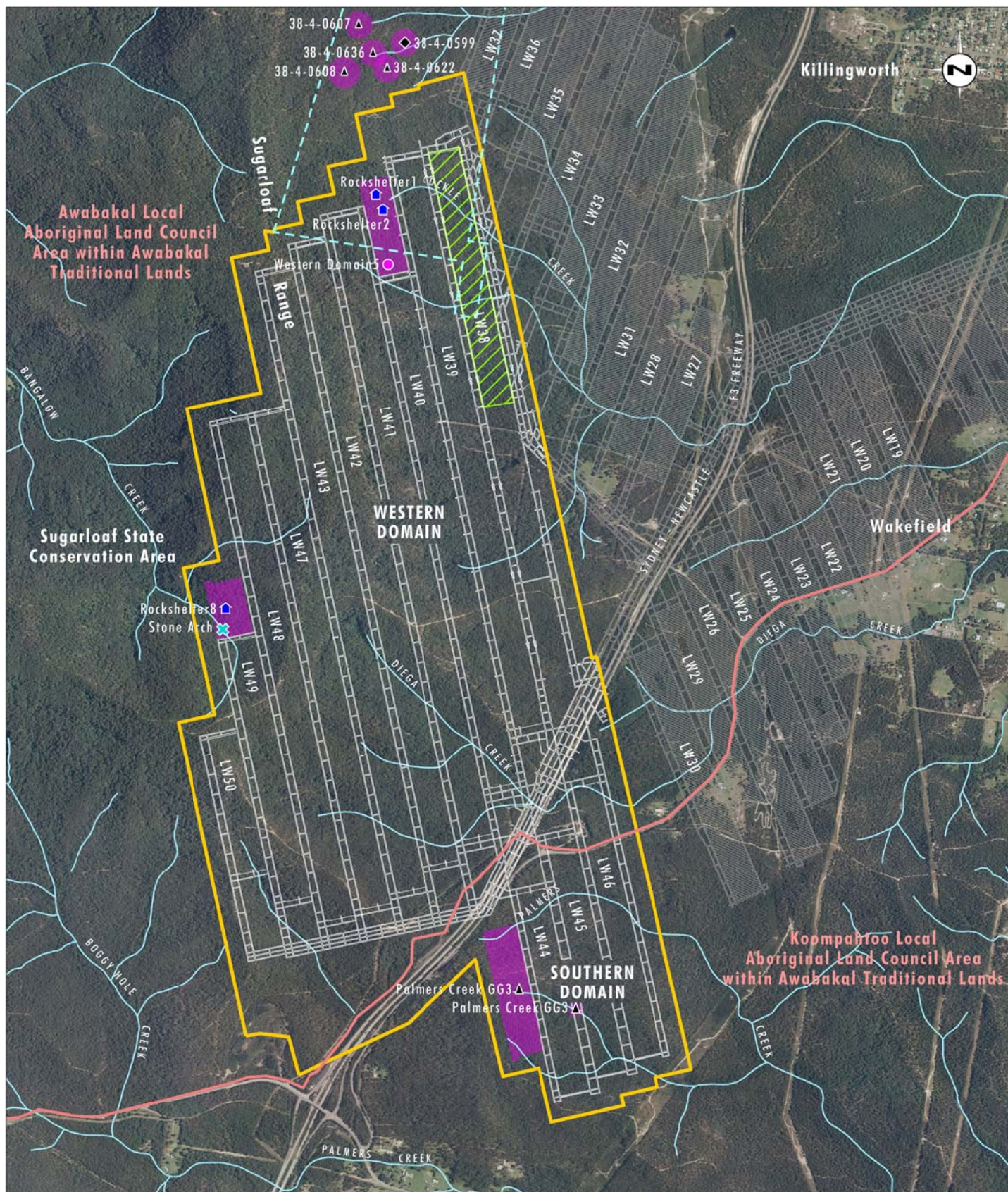
Legend

 Continued Underground Mining Area	 CCL718 Lease Boundary
 West Wallsend Colliery Pit Top Facility	 ML1451 Lease Boundary
 Longwall Progression	 Tasman Mining Lease Boundary
 Proposed Underground Workings	 Newstan Mining Lease Boundary
 Sugarloaf State Conservation Area	
 First Workings	
 CCL725 Lease Boundary	

File Name (A4): R03_V1/2553_283.dgn

FIGURE 1.2

Continued Underground
Mining Area and
Adjoining Mine Leases



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.5 1.0 1.5 km
1:30 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater
- ML1451 Lease Boundary
- ▲ Axe Grinding Groove
- ◆ Axe Grinding Groove with possible Art
- ✕ Feature of Aboriginal Cultural Value
- Rockshelter
- Archaeological Site

File Name (A4): R03_V1/2553_179.dgn

FIGURE 1.3

Modified Continued Underground Mining Area
within Awabakal Traditional Lands

conservation area' (*National Parks and Wildlife Act 1974* Amendment (Section 15), Schedule 8 [3]). The National Parks and Wildlife Service (NPWS – now part of the Department of Environment Climate Change and Water – DECCW) is currently preparing a Plan of Management (POM) for the SSCA, including a plan for management of Aboriginal cultural heritage. It is currently understood that the POM will be completed by late 2011 to early 2013 (pers. com. Steve Wright - SSCA Ranger). The POM for the SSCA will include proposed management of potential subsidence impacts from the proposed continued underground operations of WWC. WWC has registered an interest in the development of the POM and will work in consultation with DECCW in the development of the POM.

1.2 Background and Overview of the West Wallsend Colliery Continued Operations Project

WWC has been operating since development consent was issued for the operation in 1969 by Lake Macquarie City Council (LMCC). Early operations were mainly bord and pillar workings located in the northern areas of Consolidated Coal Lease (CCL) 725. Longwall mining has been undertaken since 1985. The proposed continued operations of WWC are shown on **Figure 1.2**.

Continued underground mining at WWC is proposed to be undertaken in two main areas, referred to as the Western and Southern Domains. Mining is currently being undertaken in the Western Domain in LW38. The majority of mining within domains is encompassed within CCL 718. Mining within CCL 718 has current development consent under the 1981 Stockton Borehole Consent (the 1981 Consent), which provides for the continuation of mining within this area. However two small portions of mining in the Western Domain are located within CCL 725 and Mining Lease (ML) 1451, as shown on **Figure 1.2**, which are not covered by the 1981 consent.

Mining within CCL 725 and ML 1451 is currently being undertaken under a Part 5 Approval granted under the *Environmental Planning and Assessment Act 1979* (EP&A Act), granted by the Department of Industry and Investment (DII) (previously Department of Primary Industries). This approval is based on the savings provisions of the Lake Macquarie LEP, which enable underground mining to be undertaken, without development consent, where an existing mining lease is related to an existing mining operation.

The savings provisions under the LMCC LEP will expire in December 2010. After December 2010 all mining within CCL 725 and ML 1451 will require a development consent under the EP&A Act. Therefore a new Part 3A project approval under the EP&A Act will be required for that portion of CCL 725 and ML 1451 covered by the current Part 5 approval after December 2010.

The overall aim of the project application is to provide for ongoing mining in CCL 718, 725 and ML 1451 and to enable continued mining under one consolidated approval that will cover the remaining operations of WWC. Although WWC only requires approval for part of the existing MLs, WWC has elected to seek a new Part 3A approval for the entire area of continued underground operations.

The key features of the WWC Continued Operations Project are outlined below in **Table 1.1**.

Table 1.1 – Key Features of West Wallsend Colliery Continued Operations Project

Major Project Components/Aspects	Proposed Operations
Limits on Extraction	Up to 5.5Mtpa ROM
Estimated Mine Life	Approximately 12 years of mining
Operating Hours	24 hours per day, 7 days per week
Number of Employees	Approximately 390 full time equivalents
Mining Methods	Underground Mining – longwall method
Mining Areas	Proposed continuation of mining within CCL 718/725 and ML 1451 and encompasses all former workings of WWC
Infrastructure	Existing West Wallsend Surface Facilities Existing No.2 and No.3 Vent Shafts Proposed future ventilation infrastructure Proposed Mining Services Facility

At this stage, there will be no major modification to the existing WWC pit top facilities as a result of the Project. Minor upgrades such as the proposed training building, potable water borehole, works associated with water re-use project and noise mitigation measures associated with the Bradford breaker and the No.2 vent shaft will all be located in previously disturbed areas

The proposed Mining Services Facility seeks to improve efficiency of delivery of materials to the underground operations by reducing the travel distance underground. It is proposed to be located approximately 6 kilometres south-west of the existing pit top facilities close to Wakefield road, as shown on **Figure 1.2**. The Mining Services Facility will be comprised of a 20 metre by 35 metre compound housing the facility and a constructed access road off Wakefield Road. It will be located in an existing disturbed area between Wakefield Road and the F3 Freeway, currently comprised of an access area and regrowth vegetation. The Mining Services Facility is proposed to be used for a range of services including a ballast and concrete borehole (providing materials for use underground) and for the provision of solcenic oil for use underground. Power to the services facility will be provided by an extension of the existing powerline which is adjacent to Wakefield Road.

As underground mining progresses additional ancillary surface infrastructure associated with continued mining operations may also be required, including the installation of additional ventilation infrastructure and potential gas injection infrastructure. The locations of this infrastructure will be determined as mining progresses, with appropriate planning, to minimise environmental impacts, consultation and management strategies to be implemented for each new facility.

Whilst no further coal mining in the former workings of WWC is proposed as part of this Project, the former workings have been included in the project application boundary to provide a consolidated approval for all workings within the WWC holding, as requested by the Department of Industry and Investment (DII). This will provide for any future works required in those existing mining areas, such as ongoing maintenance works and work associated with mine closure.

1.3 Potential Impacts of the Project

The extraction of the long walls within the proposed continued underground mining area has the potential to directly and indirectly impact Aboriginal archaeological sites and Aboriginal cultural landscape values, through subsidence (including associated valley bulging [upsidence] and valley closure) and any subsidence remediation works required to manage surface cracking. Mine subsidence may affect the proposed continued underground mining area through surface cracking of soils and outcrops, accelerated erosion, temporary drainage of waterways (including dam failure) and ponding in creeks and drainages. Subsidence also has the potential to affect existing surface infrastructure such as roads which will require works for remediation. These affects may directly impact on/or require earthworks which will directly impact Aboriginal archaeological sites and Aboriginal landscape values within the proposed continued underground mining area.

1.4 Intergenerational Equity

The necessity for this assessment to consider Intergenerational Equity was outlined as part of the DECCW's requirements for the Project (correspondence dated 11 November 2009). The management options considered for inclusion in the overall management strategy, therefore, had to be prepared taking into account the need for the project outcomes to demonstrate Intergenerational Equity (for details refer to **Sections 8.0** and **9.0**). In order for the Project to demonstrate Intergenerational Equity WWC modified the mine plan and provided a Conservation Offset Strategy (refer to **Sections 1.5** and **8.2**). Based on comments on the working draft report in relation to the Aboriginal cultural heritage values of landscape features and Aboriginal archaeological sites within the proposed continued underground mining area, WWC increased by seven the number of sites to be protected from those initially proposed and committed to additional offsets requested by the registered Aboriginal stakeholders (for details refer to **Sections 1.5, 8.7, 8.8** and **9.3**).

While it was assessed that the overall conservation offset strategy had the potential to meet the requirements of Intergenerational Equity from an archaeological perspective, the registered Aboriginal stakeholders assessed that Intergenerational Equity was still not being met by the conservation offset strategy provided by WWC in relation to the Project area (refer to **Sections 8.7, 8.8** and **9.3**).

1.5 Modifications to the Mine Plan

The mining layout of the longwall blocks in the Western and Southern domains was initially designed in consideration of a number of factors and sensitive surface features, these include:

- a) the location of the F3 Freeway and adjacent easement which runs north to south through the WWC proposed longwall area and contains several utilities of significant importance;
- b) the alignment of previously mined longwall blocks and mains development;
- c) the major geological structures which intersect the coal seam to be mined;
- d) the predicted economic limit of mining to the north of the longwall blocks;
- f) the ML boundaries; and
- g) to minimise the risk of impact on the Palmers Creek alluvium.

Following the completion of preliminary assessments as part of this Part 3A application, significant changes have been made to the proposed mining layout. After extensive consultation with the registered Aboriginal stakeholders, significant changes were made to the proposed mine plan in order to protect two grinding groove sites of high Aboriginal cultural and archaeological significance (Palmers Creek Grinding Grooves 1 #38-4-1007 and 2), an artefact scatter associated with a wet soak of high Aboriginal cultural and low to moderate archaeological significance (Western Domain 5 - #38-4-0993 - wet soak with artefact scatter site) and four landscape features of high Aboriginal cultural value (a stone arch and three rockshelter sites), as shown on **Figure 1.3**. The mine plan changes also reduced the level of predicted impact to a third grinding groove site of high Aboriginal cultural and high archaeological significance (Palmers Creek Grinding Grooves 3). The modifications to the mine plan to protect these significant sites/landscape features have resulted in the sterilisation of approximately 2.04 Mt (estimated value of \$150 million) of coal resource.

Following further consultation with the registered Aboriginal stakeholders and Umwelt in March and April 2010 (at the working draft report stage), WWC committed to protecting an additional five previously recorded sets of grinding grooves (#38-4-0607, #38-4-0608; #38-4-0622, #38-4-0636 Grinding Groove sites and #38-4-0599 Grinding Grooves and Possible Art site) to the north of the proposed continued underground mining area in ML 1451. During an inspection of these sites an additional grinding groove site (Burkes Creek Grinding Grooves 1) was also located. The six grinding groove sites are assessed as having extremely high Aboriginal cultural significance. Three of the grinding groove sites are assessed as having moderate archaeological significance and three of the grinding groove sites are assessed as having low to moderate archaeological significance. WWC has guaranteed that they will not undertake any mining operations in the area of the Burkes Creek grinding groove sites that would cause any potential for damage to the sites (for details refer to **Section 8.7**). WWC provided for the protection of these sites in order to demonstrate Intergenerational Equity in relation to potential impacts from subsidence to the Diega Creek Grinding Grooves 1 site (refer to **Section 5.3.2** and **Section 8.7**). However, the registered Aboriginal stakeholders assessed that the Burkes Creek sites were not of equal value to the Diega Creek Grinding Grooves 1 site and thus while supporting their protection from future mining impact, did not support their protection as an offset for potential damage to the Diega Creek Grinding Grooves 1 site.

The modifications to the mine plan to address impacts to landscape features of Aboriginal cultural value and Aboriginal archaeological sites of significance, were made by WWC with careful consideration to developing a mine plan which is as sensitive as possible to the surface cultural features above the proposed longwall mining area and still remaining economically feasible.

1.6 Statutory and Policy Framework

The Project is identified as a Part 3A Project as defined by the State Environmental Planning Policy Major Developments 2005, and requires the approval of the NSW Minister for Planning under the *Environmental Planning and Assessment Act 1979*.

1.6.1 EP&A Act (1979)

The EP&A Act regulates development activity in New South Wales. Part 3A of the EP&A Act applies to projects that are declared to be a 'Major Project' (in accordance with Section 75B of the EP&A Act). Under Section 75U of the EP&A Act, it is not necessary to obtain a permit under Section 87 or consent under Section 90 of the NPW Act (1974 – refer to **Section 1.6.2**) to impact on Aboriginal archaeological sites/objects in relation to activities

approved under Part 3A of the EP&A Act. Projects approved under Part 3A of the EP&A Act are subject to conditions of approval issued by DoP and (where relevant) Aboriginal cultural heritage is addressed by appropriate conditions and usually managed under an Aboriginal Cultural Heritage Management Plan (ACHMP). Furthermore, Section 75J (5) of the EP&A Act states that conditions of approval for the carrying out of a project may require the proponent to comply with obligations made in a Statement of Commitments submitted by the proponent as part of the development approval process. The Statement of Commitments outlined in the EA main text will contain commitments in relation to Aboriginal cultural heritage sites/objects/landscape features and their management/conservation.

1.6.2 NPW Act (1974)

Under the provisions of the *National Parks and Wildlife Act* (NPW Act) (1974), all Aboriginal objects are protected regardless of their significance or land tenure. Aboriginal objects are defined as:

...any deposit, object or material evidence (not being a handicraft made for sale) relating to Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

Aboriginal objects are therefore limited to physical evidence and may also be referred to as 'Aboriginal sites', 'relics' or 'cultural material'. Aboriginal objects can include pre-contact⁷ features such as scarred trees, middens and artefact scatters, as well as physical evidence of post-contact use of the area such as Aboriginal built fencing or stockyards, fringe camps.

The NPW Act also protects Aboriginal Places, which are defined as '*a place that is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects*'. Aboriginal Places can only be declared by the Minister administering the NPW Act.

Under Section 91 of the Act, the Department of Environment Climate Change and Water (DECCW⁸) must be informed upon the identification of all Aboriginal Objects. Failure to do this within reasonable time is an offence under the Act.

Under Section 90 of the Act, it is an offence for a person to destroy, deface, damage or desecrate an Aboriginal Object or Aboriginal Place without the prior issue of Section 90 consent. The Act requires a person to take reasonable precautions and due diligence to avoid impacts on Aboriginal objects. Section 90 Consent may only be obtained from the Environmental Protection and Regulation Division (EPRD) of DECCW. In considering whether to issue Section 90 Consent, DECCW take into account the:

- cultural and archaeological significance of the Aboriginal object(s) or Aboriginal place(s) subject to the proposed impacts;
- effect of the proposed impacts and the mitigation measures proposed;
- alternatives to the proposed impacts;
- conservation outcomes that will be achieved if impact is permitted; and
- outcomes of Aboriginal community consultation regarding cultural values, the proposed impact of the Project on cultural values, Aboriginal cultural significance and proposed conservation measures including offsets.

⁷ Pre-contact refers to the period prior to non-Aboriginal settlement of an area.

⁸ DECCW – previously the Department of Environment and Climate Change (DECC) and prior to DECC as the Department of Environment and Conservation (DEC)

The Act also provides for stop-work orders under Section 91AA if an action is likely to significantly affect an Aboriginal Object or Aboriginal Place. The order may require that an action is to cease or that no action is carried out in the vicinity of the Aboriginal Object or Aboriginal Place for a period of up to 40 days.

It is also an offence under Section 86 of the NPW Act to disturb or excavate land for the purpose of discovering an Aboriginal object, or to disturb or move an Aboriginal object on any land, without first obtaining a permit under Section 87 of the NPW Act. In issuing a permit under Section 87, DECCW will take into account the:

- views of the Aboriginal community about the proposed activity;
- objectives and justification for the proposed activity;
- appropriateness of the methodology to achieve the objectives of the proposed activity; and
- knowledge, skills and experience of the nominated person(s) to adequately undertake the proposed activity.

As discussed in **Section 1.6.1**, projects approved under Part 3A of the EP&A Act do not require the proponent to obtain a Section 87 permit or Section 90 consent to impact on Aboriginal cultural heritage sites/objects. However, Department of Planning (DoP) will distribute the assessment report to the DECCW for their review and input on the conditions for any Project Approval (or requirements for further information if it is perceived by the DECCW that adequate information is not within the assessment report; or if it is not demonstrated within the assessment report that appropriate Aboriginal consultation has taken place). For the DECCW to be able to complete this process it is necessary that the assessment report addresses not only the type of management/mitigation measures to be undertaken for each site to be impacted/protected within a project area, but also that an appropriate research design and methodology is provided for any salvage works proposed and that this has been assessed by the registered Aboriginal stakeholders. Thus the Aboriginal consultation process for a Part 3A project must address not only the survey, assessment and management process, but also the questions to be posed for the research design and the methodology for any salvage proposed and for the management/conservation of sites outside continued underground mining areas (where relevant).

1.6.3 DECCW Interim Community Consultation Requirements for Applicants (2004)

Aboriginal consultation for this assessment has been undertaken in accordance with the *DECCW Interim Community Consultation Requirements for Applicants 2004* (ICCRS - for details of the consultation process refer to **Section 2.1** and **Appendices A** and **B**).

1.6.4 Reporting Requirements

The information presented in this assessment report broadly follows the *NPWS Draft Standards and Guidelines for Archaeological Report Writing (1997)* and DECCW's *Part 3A Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (2005)*.

1.7 Report Authorship

During the reporting process information relevant to the Aboriginal cultural heritage values of the proposed continued underground mining area was provided by Shane Frost representing Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC), Nola Hawken, Dene Hawken and Kerrie Brauer representing Awabakal Traditional Owners Aboriginal Corporation (ATOAC), Cheryl Kitchener representing the ALALC, Donna and George Sampson representing Cacatua Cultural Consultants (CCC⁹) and by Lois Towney representing KLALC (prior to its closure).

The information provided by the registered Aboriginal stakeholders has been added directly into the text as quotes and appears in indented *italics* accompanied by the name of the Aboriginal stakeholder group on whose behalf the information was supplied and the date on which it was supplied (for further details on the consultation program undertaken for this report refer to **Section 2.0** and **Appendices A, B and K**). Other comments/advice on the working draft report has been taken into account throughout the report and the set out of the report has been revised significantly in response to Aboriginal stakeholder recommendations.

Jillian Huntley co-ordinated the archaeological assessment and was the primary author of Sections 1.0 through 5.0 of this report. Jan Wilson (Manager Cultural Heritage) prepared Sections 6.0 through 9.0 of the report and provided strategic review and advice throughout the assessment and consultation process. Both Jillian Huntley and Jan Wilson were involved in the Aboriginal stakeholder consultation process. Fieldwork was conducted by Aboriginal stakeholder representatives from ADTOAC, ALALC, ATOAC and KLALC (for details refer to **Sections 2.2 and 2.3**) and Umwelt archaeologists Jillian Huntley, Amanda Reynolds, Julian Travaglia and Jan Wilson. Paul Amidy (Project Manager) and Barbara Crossley (Director) of Umwelt provided strategic direction for the project and conducted the quality review of this report.

1.8 Structure of this Report

Section 2.0 of this report summarises consultation conducted with the five Aboriginal stakeholder groups who registered an interest in the project under the DECCW's ICCRs as well as any agency consultation conducted in relation to Aboriginal heritage of the proposed continued underground mining area. Associated documentation is included in full in the appendices of this document.

Section 3.0 provides background information in relation to the known Aboriginal cultural heritage values (**Section 3.0 Part A**); the physical geographic context (**Section 3.0 Part B**); and the ethnographic and archaeological context (**Section 3.0 Part C**) of the proposed continued underground mining area and its environs. This information is used to prepare a predictive model for Aboriginal archaeological site location, site type, site content and site preservation, to assist with the preparation of a survey methodology and with the Aboriginal cultural heritage and archaeological significance assessment (**Section 3.0 Part D**).

Section 4.0 presents the survey methodology utilised for the project (which was prepared in consultation with the registered Aboriginal stakeholders).

Section 5.0 details the results of the survey undertaken by the relevant registered Aboriginal stakeholders and archaeologists and provides descriptions of the landscape features

⁹ CCC provided comments throughout the report during May and June 2010. Subsequently (17 June 2010), CCC requested their comments be removed from the main text and replaced by a letter of comment which is included in **Appendix J** and referred to in **Appendix I**.

assessed as being of Aboriginal cultural heritage value, and of the Aboriginal archaeological sites recorded during the survey.

Section 6.0 assesses the Aboriginal cultural heritage and archaeological significance of the sites and Aboriginal cultural heritage values of features of the landscape within or in close proximity to the proposed continued underground mining area.

Section 7.0 considers the potential impacts on Aboriginal cultural heritage values and archaeological sites and values that may arise from the project.

Section 8.0 discusses the management options available to mitigate/manage the impact of the project on Aboriginal cultural heritage values and Aboriginal archaeological sites. This section also provides a detailed discussion of conservation offsets proposed by WWC and discussion on these offsets from an Aboriginal cultural heritage and/or archaeological perspective. The appropriateness of the management options are then considered in terms of meeting the requirements of Intergenerational Equity from an Aboriginal cultural and archaeological perspective and also from the perspective of mine feasibility.

Section 9.0 outlines the proposed Aboriginal cultural heritage and archaeological management strategy for the proposed continued underground mining area which has been prepared taking into account the proposed impacts to Aboriginal cultural heritage landscape values and Aboriginal archaeological sites from an Aboriginal cultural and archaeological perspective and the requirement for the project outcomes to consider Intergenerational Equity.

Section 10.0 lists the references cited in the text.

2.0 Aboriginal Stakeholder and Agency Consultation and Participation

The consultation and participation strategy for the assessment has been to involve registered Aboriginal stakeholders early in the process and to maintain an open ongoing dialogue throughout the assessment. This has involved consultation with registered Aboriginal stakeholders at key times within early stages of the project and incorporation of their comments, advice and recommendations into project design and strategic decision making.

The reporting process has included participation of the registered Aboriginal stakeholders at the working draft and final draft stages and several sections of the report include direct input by the participating registered Aboriginal stakeholders (refer to **Section 3.0 Part A, Sections 5.2, 6.1, 7.0, 8.0, 9.0** and **Appendices A, B, J, K and L¹⁰**). In addition, the text has been substantially revised and reconfigured based on Aboriginal stakeholder comments and advice on language and the set out of the working draft version of this report.

Sections 2.1 to 2.5 summarise the consultation program conducted with the five registered Aboriginal stakeholder groups who identified an interest in the proposed continued underground mining area through the notification process undertaken in compliance with the DECCW ICCRs. A detailed consultation log is also included in **Appendix A** and supporting documentation (such as correspondence and copies of advertisements) is included in **Appendix B**.

Sections 2.6 and 2.7 summarise the agency consultation conducted with the National Native Title Tribunal and the DECCW in relation to this Aboriginal Cultural Heritage and Archaeological Assessment.

2.1 The DECCW ICCR Process

In accordance with the DECCW ICCRs (2004) the following notification process was undertaken in the early planning stage of the project.

On 19 November 2008, correspondence was forwarded to the DECCW, Lake Macquarie City Council, ALALC, National Native Title Tribunal (NNTT) and the Office of the Registrar of Aboriginal Owners, Department of Aboriginal Affairs, and to the KLALC on 2 December 2008. The purpose of this correspondence was to notify these organisations and statutory bodies of the location, nature and scope of the proposed development and to request that WWC be made aware of any relevant Aboriginal stakeholder groups not previously known to them within 10 working days (four groups: ADTOAC, ALALC, ATOAC and KLALC had been identified as stakeholders during previous cultural heritage assessments in the area).

No previously unknown Aboriginal stakeholders were identified by the notification process.

In accordance with the ICCRs a request for registration of interest in consultation regarding Aboriginal cultural heritage for the proposed continued underground mining area was made via advertisements in the *National Indigenous Times* (Issue #167 Thursday 27 November 2008) and the *Newcastle Herald* (Thursday 20 November 2008). These advertisements briefly outlined the location, nature and scope of the proposed project and invited registration of interest from Aboriginal groups or individuals wishing to participate in the consultation program.

¹⁰ Please note that **Appendices J and L** are not for public display

As a result of the notification conducted, on 2 December 2008, CCC registered an interest in consultation for the cultural heritage component of the project.

On 3 December 2008, correspondence was forwarded to the five Aboriginal stakeholder groups known to have an interest in the proposed continued underground mining area and surrounds (ADTOAC, ALALC, ATOAC, CCC and KLALC). This correspondence included a letter outlining the location and nature of the proposed continued underground mining area and invited the known registered Aboriginal stakeholders to participate in a workshop/meeting to discuss the proposed field survey strategy for this area.

2.2 Consultation Regarding the Survey Strategy

A number of meetings were held with the five registered Aboriginal stakeholder groups during December 2008 to workshop the survey strategy for the proposed continued underground mining area. A detailed summary of these meetings is included in the consultation log in **Appendix A**. At the meetings a draft survey methodology was presented as a starting point for discussion. Several modifications to the draft survey strategy were made following the comments and advice provided by registered Aboriginal stakeholders at the workshops and the final survey strategy was endorsed by all registered Aboriginal stakeholders prior to the commencement of the field program (refer to **Section 4.1** and **Appendix B**).

2.3 Aboriginal Stakeholder Consultation During Field Survey

During the field survey the precise location of transects was selected by all participants collaboratively. In addition to the recording of archaeological sites the locations of landscape features of cultural value identified by survey participants were also recorded. Consultation regarding survey coverage was conducted during the survey prior to the finalisation of the field program to ensure that all registered Aboriginal stakeholders were satisfied with the level of investigation on which this assessment would be primarily based (refer to **Appendix A**). As a result of Aboriginal stakeholder comments and advice, additional survey was instigated prior to the end of the fieldwork period. It is further noted that ADTOAC and ATOAC raised concerns regarding the survey limitations specifically in relation to more coverage of areas they thought likely to have rockshelters. Agreement was reached, however, that survey coverage was adequate for this assessment, though it was noted by ADTOAC and ATOAC that additional survey could lead to the recording of more sites as the survey only sampled the proposed continued underground mining area.

2.4 Consultation Regarding the Mine Plan for the Underground Mining Area

Prior to finalisation of the proposed continued underground mining area mine plan, meetings were held between Jillian Huntley (Archaeologist Umwelt) and the five registered Aboriginal stakeholder groups (meetings were held from 3 to 16 April 2009 - refer to **Appendix A**). The purpose of these meetings was to obtain preliminary advice and comment regarding the cultural significance of the overall proposed continued underground mining area and the sites and landscape features recorded during the field survey undertaken to that date. Prior to strategic decisions regarding finalisation of the mine plan, an explanation of the Aboriginal cultural significance of the area surveyed and the sites/landscape features recorded to that date was provided to WWC. The early provision of this information was to ensure that it could

be taken into consideration (where possible relative to overall mine feasibility) in the final mine plan.

Based on the advice provided to WWC on the Aboriginal cultural significance of landscape features and/or Aboriginal archaeological sites, significant changes to the draft mine plan were made in order to conserve these features/sites (refer to **Figure 1.3** and **Section 1.5**).

2.5 Consultation Regarding the Draft Archaeological Assessment and Aboriginal Significance Assessment

A working draft assessment report was prepared that detailed the background to the project, the findings of the survey, the archaeological significance of the Aboriginal archaeological sites within the proposed continued underground mining area and the management, mitigation, and conservation offset options thought appropriate from an archaeological perspective. The working draft report also took into account advice, comments and management recommendations provided by the five registered Aboriginal stakeholder groups throughout the survey and assessment process undertaken to that date.

In early March 2010, the 'working draft' report was provided to the Aboriginal stakeholder groups and meetings were held over the period 2 to 25 March 2010 with the aim of having the registered Aboriginal stakeholders prepare sections of the report related to Aboriginal cultural values, Aboriginal cultural significance of the Sugarloaf Range area and site and landscape features recorded during the survey, and the provision of advice and comment for inclusion into the proposed management outcomes and management strategies (refer to the Statements of Significance in the preface of this report and **Sections 3.0 Part A, 5.2, 6.1, 7.0, 8.0 and 9.0 and Appendices A, B, J, K and L¹¹**). This process allowed the registered Aboriginal stakeholders an opportunity to use their own voice to contribute directly into the reporting process and to identify the extremely high Aboriginal cultural significance of the Sugarloaf Range area and the landscape features and Aboriginal archaeological sites it contains. It also allowed the opportunity to raise concerns in relation to cumulative impacts of development on Aboriginal cultural heritage within the Sugarloaf Range area.

Advice was also provided by the registered Aboriginal stakeholders on the use of culturally appropriate language and terminology and many sections of the report were revised and the report was reconfigured in response to this advice.

Following receipt of comments and advice from all Aboriginal stakeholders registered for the project the working draft was made into a final draft report, which was circulated for further Aboriginal stakeholder comment and advice on 17 May 2010. All further comments were incorporated into the final report during the period 1 June and 20 June 2010.

Sections of the report written by the registered Aboriginal stakeholders are shown as indented *italics* and referenced to source.

It is noted that that KLALC closed shortly after the provision of comments on the working draft report and thus was unable to comment on the final draft. The final draft was provided to the NSWALC with a letter identifying that KLALC had commented on all aspects of the continued underground mining area that related to its LALC zone. The only aspect on which KLALC had been unable to provide comment prior to closure was on the Research Design and Methodology (refer to **Appendix I**). In relation to the Research Design and Methodology, feedback was received from the four other Aboriginal stakeholder groups registered for the continued underground mining project. NSWALC (Stephen Merritt, Zone

¹¹ Please note that **Appendices J and L** are not for public display

Director NSWALC pers. comm. 3 June 2010) advised that they would be taking responsibility for matters pertaining to Aboriginal cultural heritage in the former KLALC area and that they would participate in any consultation arising post-Approval.

It should also be noted that on 17 June 2010, CCC requested all the sections they had written throughout the report be removed and instead they provided a letter of comment. The CCC letter of comment is located in **Appendix J** as it contained information initially prepared by ATOAC and which ATOAC (6 June 2010) has requested be for restricted viewing by the other Aboriginal stakeholders, DoP, DECCW and WWC.

2.6 National Native Title Tribunal Results

A search of the National Native Title Tribunal's (NNTT's) National Native Title Register, Register of Native Title Claims, Unregistered Claimant Applications and Register of Indigenous Land Use Agreements was requested in August 2008. The search parameters were specified as the Cessnock and Lake Macquarie Local Government Areas. Results of the search were received from the NNTT on 19 February 2009. Only one result was returned from the search, an active Indigenous Land Use Agreement (ILUA) in the Lake Macquarie Local Government Area (NNTT reference NIZ2000/001).

An ILUA is separate from Native Title, in the sense that ILUA's can be negotiated and are not dependant on the Native Title being claimed, Native Title being proved to exist in an area, or the parties negotiating the agreement having passed the Native Title Registration Test (NNTT 2008-2009).

ILUAs can be formed on the based on the following:

- native title holders agreeing to a future development;
- how native title rights coexist with the rights of other people;
- access to an area;
- extinguishment of native title; and/or
- compensation (NNTT 2008-2009).

ILUA NIZ2000/001 is located wholly outside of the proposed continued underground mining area. The land subject to the ILUA is shown in **Appendix C**.

2.7 DECCW Consultation

Initial DECCW consultation was undertaken with Bronwyn Conyers (8 January 2009) of the Central Coast and Hunter Range Region of the DECCW in relation to the proposed survey and survey methodology for the section of the proposed continued underground mining area that falls within the SSCA (refer to **Figure 1.2**). The consultation was based around the requirement for an s.21 Permit for the survey of the SSCA. The s.21 Permit was approved in March 2009.

WWC undertook consultation with DECCW (Aboriginal Cultural Heritage Division, Northern Directorate, Coffs Harbour) on 23 February 2010 at the DECCW Office in Newcastle. The aim of this meeting was to discuss the suitability of a conservation offset strategy under consideration by WWC (refer to **Sections 8.0 and 9.0**) that included funding for projects

within the SSCA. The meeting was held ahead of consultation with the registered Aboriginal stakeholders in relation to the working draft report as WWC wanted confirmation that DECCW felt the offsets were appropriate/workable from a DECCW perspective.

NPWS (Central Coast and Hunter Range Region) was unable to attend the meeting on 23 February 2010, so WWC undertook consultation with NPWS at its Bulga Office on 26 February 2010. The aim of this meeting was also to discuss the suitability of the conservation offset strategy under consideration (refer to **Sections 8.0** and **9.0**).

3.0 Aboriginal Cultural, Physical, Ethnographic and Archaeological Context

This section of the report is provided in four parts. Part A presents statements of the known Aboriginal cultural sites and values for the general Sugarloaf Range area and discusses the traditional, historic and cultural values held by the registered Aboriginal stakeholders and other Aboriginal groups that have been required to provide cultural value statements in the past. Part B discusses the physical (geographic) context of the area. Part C provides the ethnography and the archaeological context. Part D combines this information to prepare a predictive model for Aboriginal archaeological site location, site type, site content and site preservation within the broader Sugarloaf Range area. This information was used to assist with the preparation of a survey methodology (refer to **Section 4.1**) and as the framework for this Aboriginal cultural heritage and archaeological significance assessment (refer to **Section 6.0**).

Section 3.0 Part A

3.1 Aboriginal Cultural Knowledge and Values – Sugarloaf Range and Environs

3.1.1 Awabakal Descendants Traditional Owners Aboriginal Corporation

We know that the roadways and logging tracks present in the continued underground mining area today have been constructed along the original tracks that were used by our People, the Awabakal, as they used these areas and travelled through to the various other areas within their Traditional Country. We would then expect to find areas that were camp sites on the ridgelines and spur crests where the tracks are, or close by. (Shane Frost ADTOAC - 29 October 2009).

As children growing up, we lived in and were taken into many areas of the Traditional Country of our Ancestors. As a result, we were told 'stories' that had been passed down for centuries that related to these areas. These vivid 'stories' that were told to us then and viewed through children's eyes, now give us a clearer insight into our Cultural Heritage as adults. These 'stories' told about the lake, creeks and waterholes, the mountains and landscapes within the surrounding areas and how they are intrinsically connected. One of these 'stories' gives us insight into the importance of the Sugarloaf Range in its entirety, from one end to the other and the connection that several important features that exist within its terrain have with each other and also with other features within our Traditional Country, but then, how they also separately exist in their own right. We would love to tell these 'stories' here but we believe it is not for others at this time. So we would reserve this right as Awabakal People to hold onto this part of Our Cultural Heritage for the present moment.

What we are trying to say here is that although the Sugarloaf Range is quite a large physical feature within this area, it is but one of many significant features (both large and small) that are fused together into a much larger picture but at the same time uniquely separate. This is conveyed through our Oral history which in turn can divulge certain Spiritual accounts also of our People, the Awabakal. This is why we reserve the right not to reveal certain information here. (Awabakal Descendants Traditional Owners Aboriginal 25 March 2010).

3.1.2 Awabakal Traditional Owners Aboriginal Corporation

"Mt Sugarloaf still to this day is an impressive Awabakal Dreamtime landmark, bearing physical reminders of our Awabakal ancestral families' lifestyle and presence. The amount of physical sites may never be fully known, but even if every single site is not found, we believe that the cultural integrity and organic value still remains a constant for our lives.

When we visit Mt Sugarloaf, there is an inexplicable spiritual reaction to the landscape and at times someone becomes intuitively drawn to or affected by a particular site, as if the ethereal environmental space is meshing with someone's 'cultural DNA'" (Awabakal Traditional Owners Aboriginal Corporation 10 & 30 March 2010).

Additionally,

"There are some of us who are fortunate enough to have stories passed down through the generations of time but this communication or 'oral history' is meaningless unless we keep these ancient whispers alive. To me oral history is a 'living letter' passed between generations, making sure that those who are following in the footprints of their ancestors will hear these same whispers that are essential to life.

Of course we as a family have been told stories about past generations, their personalities, their relationships and what they all did here in their traditional lands. However at the end of the day, all the stories, customs and traditions are there for people to connect with each other and, explore the mysteries of life.

One day I hope we all realise the importance of this before it's too late. This is one of my Awabakal dreams" (Nola Hawken, ATOAC 17 March 2010).

Additionally,

"When the Sugarloaf Mountain Range is viewed from any direction we know we are looking at a place our People have continually visited, and it is something that is symbolic to us. When we go up there and visit the sites it is like looking at a reflection of our ancestors. We know these sites are part of our lives and that familiarity can sometimes be taken for granted, but it is those landmarks and features that define us within our Awabakal country. It is a special place, and the connectivity between other special places like Nobbys, Wollombi and Sugarloaf, just to name a few, it's not just about the place, but what our culture means to us as Awabakal people and how we are connected with our cultural places" (Kerrie Brauer, ATOAC 17 March 2010).

Note to DECCW and DoP - Please also refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix K. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCS recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

3.1.3 Awabakal Local Aboriginal Land Council

In the past ALALC has spoken of the ceremonial importance of the Sugarloaf Range area, the restriction of access to some areas that were related to men's

business, to the fact that there are stone arrangements, scarred trees, burials, grinding grooves, and potholes in association with grinding grooves that have been ground out to make them larger so they hold water for longer, and also direction markers (some were stones and some were grooves in the rocks). The following quotes are excerpts from a report that ALALC prepared in relation to the importance of the Sugarloaf Range area in 2003.

The Sugarloaf Range is ... important to us - it allows us to keep our ties with the past. We must preserve our ties with the past; we must not lose our traditions which are all part of our connection to the land and our sense of belonging. We must try and keep Sugarloaf as natural as we possibly can. We have to have progress ... but we as Aboriginal people are losing our identity as a community and we need to be able to get back to places like the Sugarloaf area, it's very important that we have these places to show our young people, educate our kids back to our culture.

Our [Aboriginal] culture is written there in the Sugarloaf Range, written in the caves, written on the ground, written on the trees, it's all around. We need to be able to go to these places to teach the kids how to read the land. Our kids have been missing out; sadly they do not respect their Elders. Getting back to the land with the Elders will teach our kids respect for the Elders, for the land and for themselves. We would not have jails bulging with young Aboriginal people if they had the chance to learn about their culture, to have the chance to preserve their past, to preserve the land as natural as it can be, we must not lose our tradition and connection to the land.

Sugarloaf has a big toolmaking area ... they ground axe heads all over the top of there, there is a lot of places where they rubbed them... It was very important to have this sandstone to grind the axe heads which was a very important part of tribal life, the axe. It played a big role in the survival of the Awabakal people, not only for hunting but it was used too, in defence at odd times. This will give you some idea ... how important and how significant these sites are up at Sugarloaf.

They used ground out pot holes to hold water to use as part of the rubbing down of the axe, they would have a little bark bowl there to scoop up the water and it is very important that water was used. That's why you can see how well it has been used over thousands of years. Some of these pot holes are pretty deep you know, especially up there. ... When it was a bit dry the water would stay there, in the deep pools, there where water would stay well covered over where the sun wouldn't dry the water out...in this area too there is one waterhole, you know the Aboriginal oral tradition reckons it never runs dry, you know orally speaking, but there's a few waterholes up there. This area is rich in stuff like that, Sugarloaf, and it's very important. It's not only as it has a physical significance to Aboriginal people, but spiritual side too, because this is where we are going to bring our young men back up and show them how they actually done the waterhole and to make tools and that. It is very important to pass the knowledge on to this young generation, actually how they done that, and the importance of it, so Sugarloaf is very important.

Direction markers were important things. Oh yes. People made different signs for different things, it's very important to read the land, very important. Just like today we have road signs, street signs to give directions to the people travelling.

We have different grinding grooves to show where the waterholes are and things like this. This stuff is very important and we have signs on the ground, prints, emu prints and things like that pointing to different areas. ... The idea is to leave

a story behind and it was for the survival of the whole clan, and there is stuff there anyone coming through from different tribal areas, they could look, and they have the same thing up there. They can understand. It was left there for them for directions to the waterholes and for what to eat.

There are crying trees in the Sugarloaf Range, you get them right through the country, we've found them at Wollombi, Murrays Run, Belmont, Cessnock and Cooranbong. When I see a crying tree I know right away that there are graves around and this means the area is not suitable for burial underground and so they sit them up and cover them over. They usually use the gum trees with the white bark so you see the red stains like tears running down ... these cuts in the tree they symbolise that there is a grave in the area. Like a tombstone with a name on it, the cuts symbolise that a person or people are buried in the area. Well this is how traditional Aboriginal people mark their grave sites. The little cuts make the tree weep; the sap runs down like tears. They mark it with teardrops, a tombstone, to let us know that there is a grave there and to respect them tears. When we are on site surveys if we see this type of tree we know that there is a grave there, or a couple of graves there and it is very important that we look for that because sometimes you don't get the sandy soil where you naturally think "oh, it's easy digging for a gravesite" and sometimes, on a number of occasions we have come across where the grave is a sitting up one. You know sometimes they buried them sitting up, they weren't always laid down. The cuts on the tree, the tears, that was a symbol to let people know that there was a grave there.

From the oral histories that have been passed onto the membership at the ALALC we are certain that the women and men both played a large part in the stories that are associated with the range, these stories will not be shared within this document but are available to the members from the knowledge holders if they are considered appropriate (ALALC 8 April 2010).

3.1.4 Koombahtoo Local Aboriginal Land Council

KLALC Elders and many of our members have spent a great deal of time in the Sugarloaf Range area. They still like to visit to see the sites up there, especially the grinding groove sites which are very significant to them. They tell us how the men ground their axes and other tools up there and how they ground out the little potholes in the rocks in the creeks to make them larger so that they would hold more water and hold it for longer. The Elders love to visit the area to see and sometimes gather the plant and medicine foods that grow up there that you can't find anywhere else except up in the range.

From the top of the range you can see all over Awabakal lands, the range, the hinterland, Lake Macquarie and the sea. The Elders tell us that men went up into the higher parts of the range for ceremony and we know that there are sites up there related to ceremony like stone arrangements and scarred trees and direction markers. Some of the scarred trees are very special as they have had large shields removed that were used in ceremony and some trees with white bark have been cut so that the red sap runs down like tears. We call these crying trees and they mark burials. There are also camp sites where people stopped for the night or maybe just a meal while they were up in the range. A lot of our favourite bush tucker grows up there and there are giant grass trees that must have been there for generations of Awabakal people and generations of the Aboriginal people that are now members of Koombahtoo Local Aboriginal Land Council.

The Sugarloaf Range, including the area proposed by WWC for their underground mine is very important to us, very significant and we want the sites and places up there looked after properly so that future generations can visit the sites and learn more about the Aboriginal past of this area. We want to be able to continue to go up there and see the sites and we want our grandchildren and great grandchildren and their great grandchildren to be able to do the same (Lois Towney of KLALC - comments from meeting 9 March 2010).

3.1.5 Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

3.2 Previously Recorded Cultural Value Assessments

The following comments on the importance of the broader Sugarloaf Range area have been derived from Aboriginal consultation undertaken for an unrelated project (*Proposed National Highway Link F3 Freeway to Branxton Project No. 60052 Additional Aboriginal Heritage Assessment - Umwelt 2003a*) that incorporated an area of the Sugarloaf Range 5 kilometres to the north of the current project area (for further details refer to **Section 3.0 Part C**). This section provides information supplied by Aboriginal groups that do not live in Awabakal lands, many of whom identify as Wonnarua. The information has been incorporated into this report as it is assessed as being relevant to the proposed continued underground mining area. The information provided in relation to the importance of the Sugarloaf area has been derived from consultation with the following Aboriginal organisations:

- Barkuma Neighbourhood Centre (BNC);
- Black Creek Aboriginal Corporation (BCAC);
- Lower Wonnarua Tribal Consultancy Pty Ltd (LWTC); and
- Mindaribba Local Aboriginal Land Council (MLALC).

All four groups were requested to comment on the importance of the Sugarloaf Range landscape as part of an *Aboriginal Cultural Assessment* they were preparing for the Roads and Traffic Authority (BNC 2003; BCAC 2003; LWTC 2003; MLALC 2003). ALALC was also involved in this project and have opted to provide their input within **Section 3.0 Part A**.

BNC (2003: 2.2) stated:

Sugarloaf Range is very important to both our community and Aboriginal people now and in the past. It features in our day-to-day lives. Firstly, Sugarloaf Mountain is a landmark. When we look out our windows or across the land, we can see Sugarloaf Mountain. Regardless of where you are in the Kurri area, the peak stands out and would have been used prior to Europeans coming as a marker to show where you are. It is a landmark. There are Dreamtime stories about Sugarloaf Mountain and it is reputed to be a ceremonial place for male initiation and some places are prohibited for women. Also, there are oral histories about burials in Sugarloaf Range. There are axe grinding grooves and artefact scatters recorded within Sugarloaf Range.

BCAC (2003: 2) stated:

Our ancestors would have used the area for many purposes. Oral histories portray the importance of Sugarloaf Range/Mountain. Aboriginal people looked at the whole landscape not just a specific point. Sugarloaf Mountain itself would have been used for ceremonies, a summer camping area, food collection, a lookout and communication.

Several Aboriginal cultural heritage sites have been previously recorded in Sugarloaf Range showing that Aboriginal people used the area in the past. There is a plentiful supply of plant and animal resources and sandstone that is useful for shelters, rock art and sharpening stone axes. Sugarloaf Range was quite possibly a trading route because the landscape could be picked out from a distance.

LWTC (2003: 7) stated that there were several reasons why the Sugarloaf Range area is important to their group, these include:

- There are oral histories for this area, in particular for Sugarloaf Mountain. These stories show the connection between the mountain and the Aboriginal people.*
- The area has been used in the past and is presently used by Aboriginal people.*
- The topography of the area provides slopes, crests and water courses with different aspects and elevations, which offer an abundant and diverse supply of resources within the sensitive area.*
- The range is flanked by Hexham Swamp to the east and Wallis/Surveyors Creeks floodplains to the west. This enhances the diversity and variety of resources for the sensitive area.*
- Resources include sandstone outcrops in the area that are suitable for tool sharpening and food preparation.*
- There is also sandstone overhangs in the area that are suitable for shelters. Rock art and deposits containing evidence of past Aboriginal use may be found in rock shelters.*
- Alluvial terraces within the sensitive area have potential to contain archaeological deposits.*
- There are several archaeological sites recorded within the sensitive area, including artefact scatters, isolated finds, grinding grooves and a stone arrangement. This shows that Aboriginal people were using the area in the past.*

MLALC (2003: 1) stated:

Sugarloaf Mountain is a landmark. Sugarloaf Range is very important to Aboriginal people past and present. Mount Sugarloaf provides a 360 degree vantage point of the surrounding areas, therefore, giving Aboriginal people the ability to see from all directions. For example, you can see all of Lake Macquarie and towards Port Stephens, Singleton, Yango, Central Coast and south towards The Entrance. ... There is a very important oral history relating to Sugarloaf Mountain. There are many ceremonial places for male initiation and some places are prohibited for women. The oral histories about myths and legends are widely known in the Aboriginal community and parts of these stories are still kept sacred to the Aboriginal Community.

In summary, even though the members of these Aboriginal groups do not live within Awabakal lands, all four indicated that the Sugarloaf Range landscape was extremely important due to numerous factors including the resources provided by the area, traditional ceremonial associations and present use as a teaching place.

3.3 Summary Aboriginal Cultural Values

From all of the Aboriginal cultural value statements provided within **Section 3.0 Part A** (and previously in the **Statements of Significance** provided in the preface to this report) it can be seen that the Sugarloaf Range area has high Aboriginal cultural value to the Awabakal

people; to the Aboriginal people who make Awabakal lands their home; and to Aboriginal people that affiliate themselves with another tribal group - the Wonnarua. That the ceremonial importance of the Sugarloaf Range area has been handed down through both tribal groups and is well known by most contemporary Aboriginal people that live in areas surrounding the Sugarloaf Range; testifies to its Aboriginal cultural significance.

The restriction of access to some parts of the Sugarloaf Range was mentioned by some groups who have indicated that some areas were for access by men only. The widespread contemporary knowledge of the use of Mount Sugarloaf as an area for male initiation suggests that initiated males and males going through the rites of initiation may have been the only persons allowed to visit this area. How far reaching this restriction was in terms of the broader Sugarloaf Range and the proposed continued underground mining area specifically, has not been identified.

In relation to sites, the Aboriginal oral history suggests that the proposed continued underground mining area may contain:

- grinding groove sites associated with waterholes and potholes within the creeklines and that the potholes in creeklines may have been enlarged by grinding so that they would hold water for longer;
- rockshelters used for occupation and possibly art;
- scarred trees which may be related to ceremony;
- crying trees related to above-ground burials/interments;
- stone arrangements related to ceremony;
- artefact scatters and isolated finds on ridge and spur crests; and
- direction markers which may be stones or grooves.

Section 3.0 Part B

3.4 Physical Context of the Proposed Continued Underground Mining Area

Please note that this section provides background information about the physical context of the Sugarloaf Range area and does not provide the information in relation to Aboriginal cultural values or perspectives. This information is provided by the registered Aboriginal stakeholders in **Section 3.0 Part A**.

3.4.1 Sugarloaf State Conservation Area

As noted in **Section 1.1**, approximately 933 hectares of the proposed continued underground mining area is located in the SSCA with the remaining 152 hectares being privately owned land outside the SSCA (refer to **Figure 1.2**). Of the total 3937 hectares of the SSCA:

- 1562 hectares are within WWC's MLs (725 hectares are outside the area proposed for continued underground mining);
- 949 hectares are within the Tasman Mine Lease area; and
- 989 hectares are outside mine leases.

Underground mining in the Tasman ML is being undertaken using the bord and pillar method which does not result in subsidence of a level that adversely impacts surface features. Therefore, impacts related to subsidence are not applicable to the Tasman ML and Aboriginal archaeological sites above the longwalls will not be impacted (Umwelt 2002). It is understood that Tasman has not applied for approval for subsidence due to the limited nature of the resource.

Subsidence from prior underground mining within the WWC MLs has resulted in negligible cracking of the soil surface; however, it has resulted in the cracking and collapse of a rockshelter (not an Aboriginal archaeological site) and the cracking of the Cockle Creek Grinding Groove site (#38-4-0118).

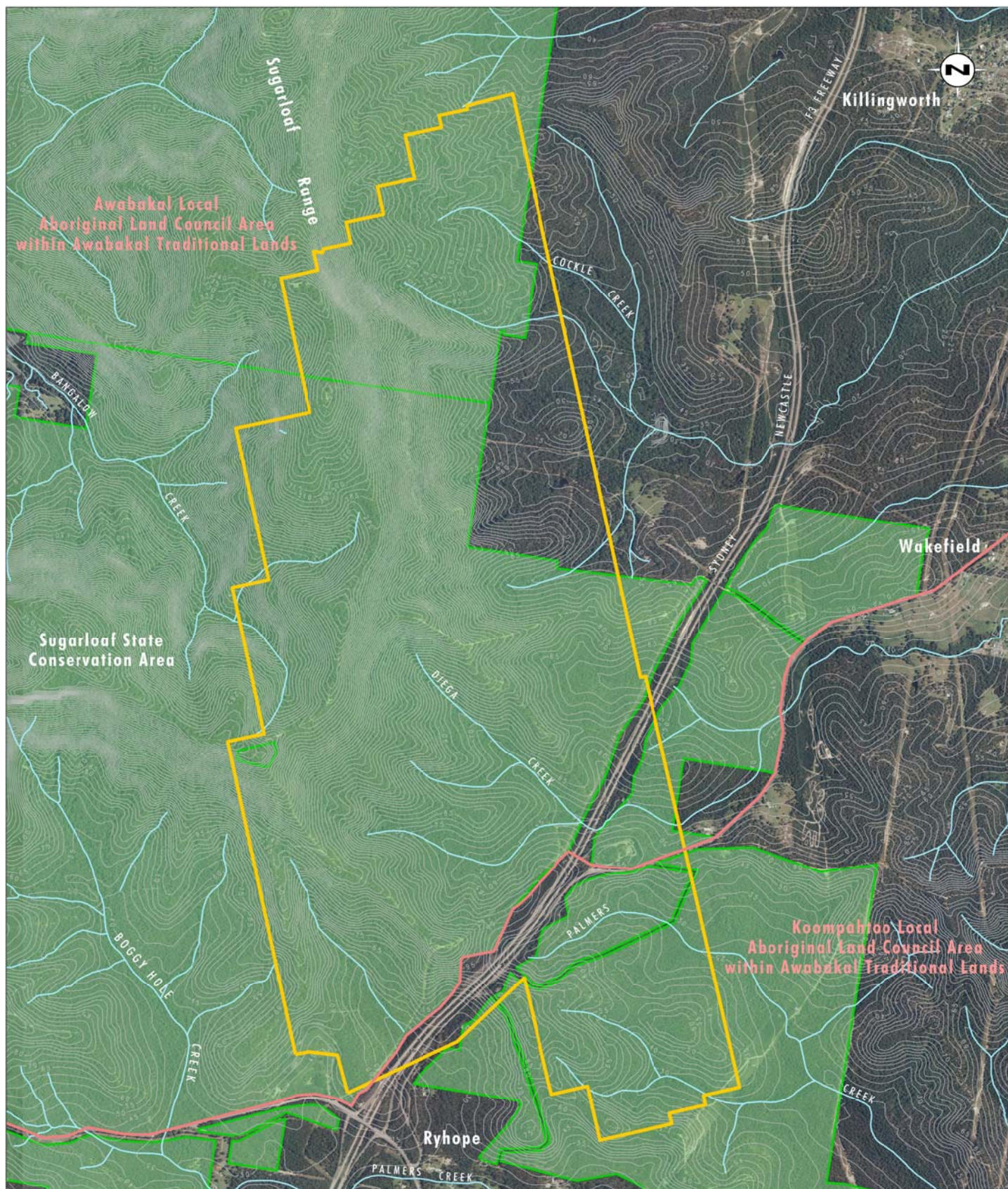
3.4.2 Topography and Hydrology

As noted in **Section 1.0**, the proposed continued underground mining area occupies the southern part of the Sugarloaf Range between the townships of Killingworth and Wakefield in the east and Brunkerville in the west. The south-eastern portion of the proposed continued underground mining area is dissected by the F3 Freeway and the Palmers Rd/Freeway Interchange at Ryhope is located on the south-western margin of the proposed continued underground mining area (refer to **Figure 3.1**).

On the eastern margin of the range the proposed continued underground mining area includes the headwaters of Cockle Creek in the north, Diega Creek in the central east and Palmer's Creek in the south (refer to **Figure 3.1** and **Plate 1**). The catchments of these creeks flow from the steep ridge in a generally eastern direction, down to the undulating spurs, slopes and foothills of the Sugarloaf Range which form the hinterland between Lake Macquarie and the escarpment country. On the western margin of the proposed continued underground mining area Bangalow Creek and its tributaries flow to the north or west to join the Sandy Creek and Wallis Creek catchments on the floor of a north-east/south-west running valley (outside the proposed continued underground mining area). Following the route of the 'Great North Walk' from the Brunkerville Trail down to Gap Road a major spur located in the south-western corner of the proposed continued underground mining area links the Sugarloaf Range to the Watagans National Park. This continuation of steeply incised sandstone escarpment is a stark contrast to the aforementioned valley floor located to the north-west above Brunkerville.

The topography of Bangalow Creek in the western watershed of the proposed continued underground mining area is notably different from the boulder filled, deeply incised morphology of Diega Creek and Cockle Creek in the east. While sandstone platforms are exposed in Diega and Cockle Creek these tend to be much smaller and less expansive than the nearly continuous platforms exposed in the upper reaches of Bangalow Creek (refer to **Plate 2**). Sandstone platforms, interbedded with exposures of conglomerate occur almost continuously (excepting a 150 metre section of boulder creek bed) for some 750 metres from the headwaters of Bangalow Creek adjacent to the main Sugarloaf Rang ridge south-west to the escarpment edge.

Major topographic features of the proposed continued underground mining area are associated with the Sugarloaf Range ridgeline which runs from the northern edge of the proposed continued underground mining area in a 'J' shape to the west (refer to **Figure 3.2**). This ridge connects the swamp country located to the north of the Sugarloaf Range at Beresfield and East Maitland and the escarpment country of the Watagans National Park and Broken Back Range in the west. From the ridge crest, major and secondary spurs run east and south-east to the foothills of the coastal hinterland between Newcastle/Lake Macquarie (refer to **Plate 3**). To the west, short western running spurs terminate before steep escarpment gives way to the valley floor above Brunkerville. The eastern escarpment is



Source: Department of Lands (2006)
Note: Contour Interval 5m

0 0.5 1.0 1.5 km
1:30 000

Legend

- Continued Underground Mining Area
- Sugarloaf State Conservation Area
- LALC Boundary
- Drainage
- Contour

FIGURE 3.1

Topography of the
Continued Underground Mining Area



PLATE 1

The Sugarloaf Range - Eastern Fall including the Cackle Creek,
Diega Creek and Palmers Creek Catchment

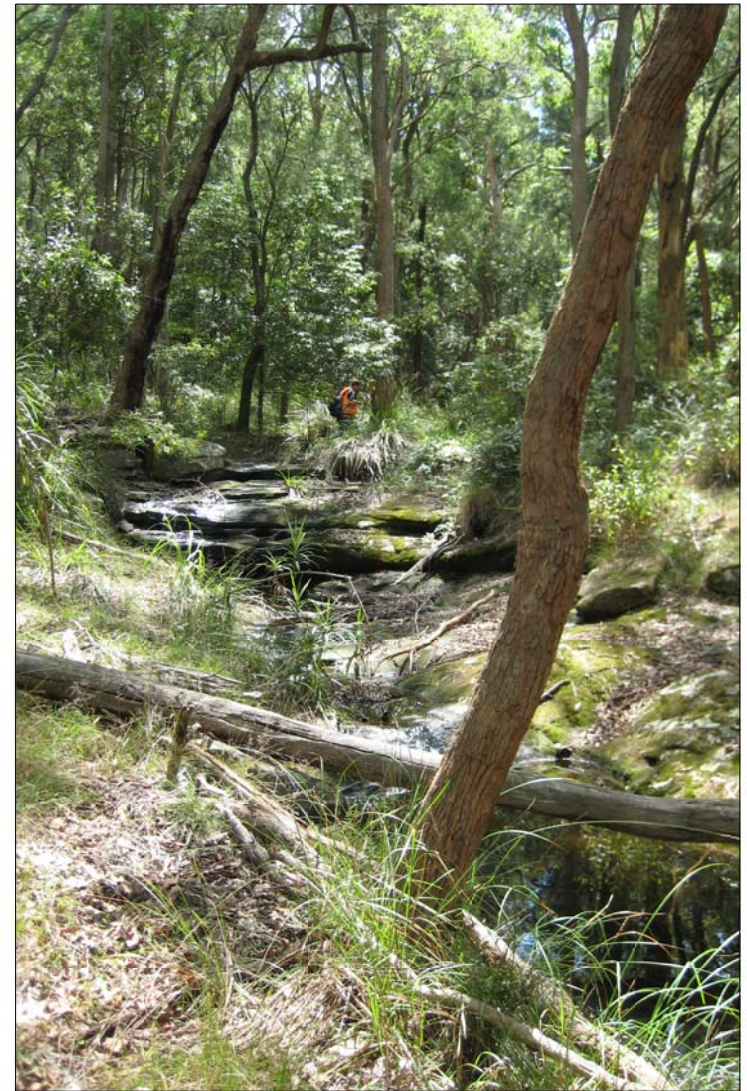
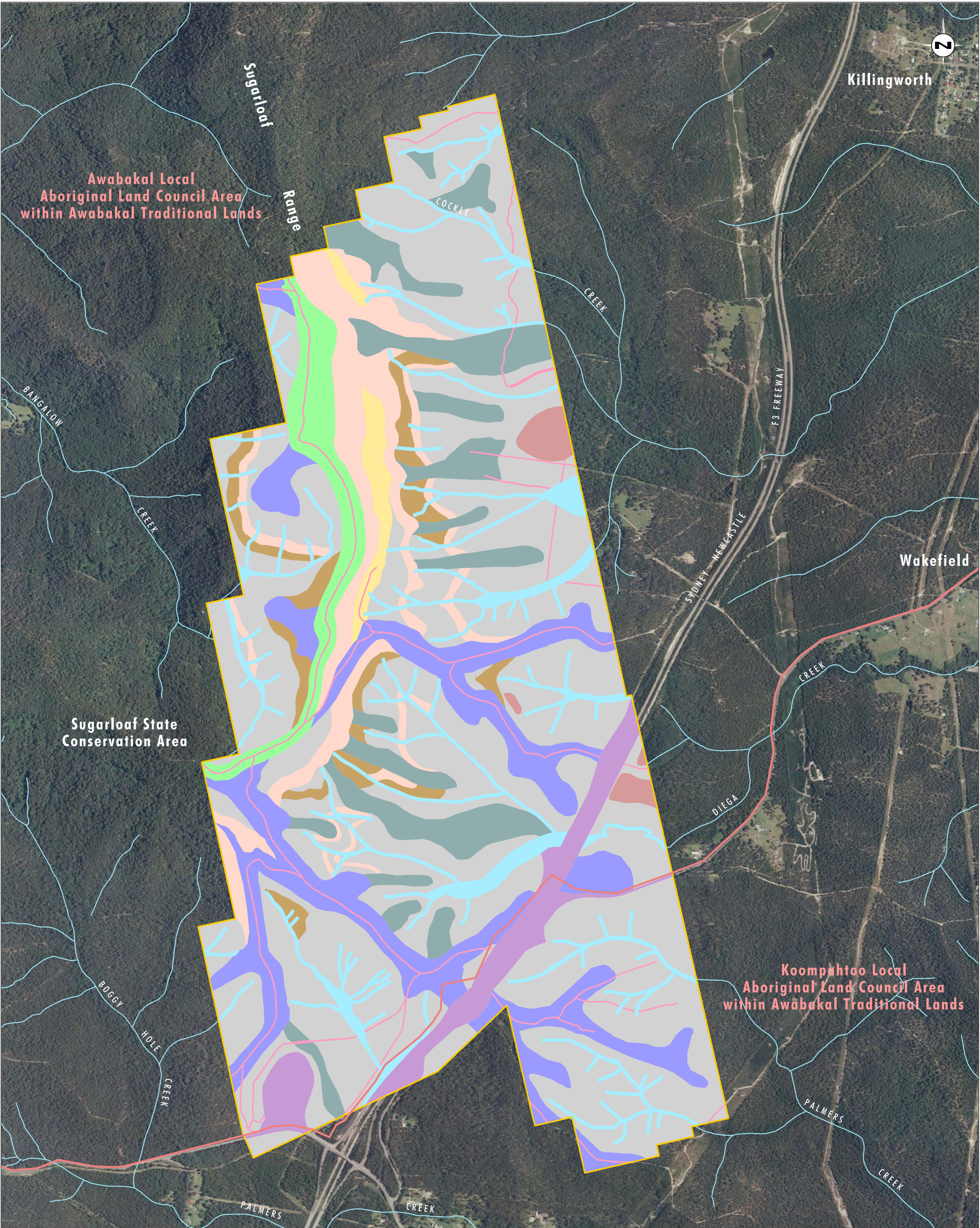


PLATE 2

Sandstone platforms in the headwaters of Bangalow Creek



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

Legend

Continued Underground Mining Area	Landform Elements: Simple Slope	Sugarloaf Range Ridgeline
LALC Boundary	Steep Slope	Major Spur Running off the Sugarloaf Range Ridgeline
Drainage Line	Knoll	Secondary Spur
	Disturbed Area	Graded Vehicle Track / Motorcycle Track / Vehicle Track
	Mid Slope Bench	Escarpment (Very Steep Gradient)
	Riparian Zone	Scree Slope / Conglomerate / Sandstone Cliff

FIGURE 3.2

Landform Elements within the Continued Underground Mining Area



PLATE 3

Example of the steep slopes on the eastern fall of the Sugarloaf Range

broken up by spurs, midslope benches and steep slopes before secondary spurs and simple slopes give way to the rolling hills of low relief which characterise the hinterland. **Table 3.1** below gives the quantitative area measurements of all landform elements present within the proposed continued underground mining area as shown on **Figure 3.2**.

Table 3.1 - Area (ha and m²) of landforms present within the proposed continued Underground Mining Area

Landform Type	Area (ha)	Area (m ²)
Disturbed Area	43.38	433,788.00
Escarpment	83.96	839,569.00
Graded Track	15.56	155,582.00
Knoll	10.90	108,995.00
Major Spur	138.11	1,381,090.00
Mid Slope Bench	5.37	53,714.40
Riparian Zone	73.03	730,307.00
Secondary Spur	94.36	943,610.00
Simple Slope	549.32	5,493,210.00
Steep Slope	32.18	321,797.00
Sugarloaf Range	37.81	378,054.00
Total	1,083.97	10,839,716.40

3.4.3 Geology and Soils

The geology of the Sugarloaf Range is predominantly Narrabeen Group quartz and lithic sandstones, conglomerates, siltstones and reddish shales (Matthei 1995). The soil profile on the upper to mid-slopes of the main ridge and spurs is comprised of residual gravelly, sandy clays overlying extremely, to distinctly, weathered sandstone and conglomerate (Strata Engineering 2006:10). These soils are skeletal and prone to slope wash and a variety of other erosion types such as rill, scald and gully, especially where soils are exposed or in the many steeper gradient headwater creeks below the main ridge crest. Sandstone and conglomerate outcrops are present on the ridge and spur crests with loose boulders or talus observed on the mid-slopes and foot slopes of the ridge and spurs; this is typical of the natural weathering processes in the area. The sandstone/conglomerate exposures are grey, orange-brown in colour and have low to high material strength (Strata Engineering 2006:10).

Stone sources suitable for the manufacture of flaked stone tools (of a raw material type previously recorded within the Sugarloaf Range) are reported to occur in close proximity to (i.e. within an easy one or two day walk from) the proposed continued underground mining area. Kuskie and Kamminga (2000:358) report tuff outcropping in Woods Gully located east of Black Hill and West of Beresfield, approximately 8 to 9 kilometres north-east of the proposed continued underground mining area. Kuskie (1994a, 1994b) has also reported a readily accessible source of silcrete in the vicinity of Woodberry Swamp approximately 19 kilometres north-east of the proposed continued underground mining area.

A raw material commonly located within sites in the Sugarloaf Range is Nobbys tuff, available from Nobbys Head (which would have been an island during the time Aboriginal people were using this resource) or washed up onto beaches north of Nobbys Head approximately 20 kilometres east of the proposed continued underground mining area (Umwelt 2007). ADTOAC (Shane Frost pers.com. 4 June 2010) also reports basalt and silcrete artefacts in sites in the Sugarloaf Range area and that basalt is available as cobbles in creeklines in the Sugarloaf Range. Furthermore, ADTOAC (Shane Frost pers.com. 4 June

2010) reports that silcrete could be obtained from Shortland (15 kilometres north-east of the proposed continued underground mining area).

In addition there were sizable quartz pebbles observed in the conglomerates of the proposed continued underground mining area during prior field survey (Umwelt 2003, 2005, 2006a, 2006c) that would have been suitable for use for stone implement manufacture.

3.4.4 Climate

The climate of the Sugarloaf Range is typical of the Lower Hunter Valley. It is temperate and influenced by proximity to the coast. Temperatures range between an average maximum of 30°C to average lows of 6.7°C (Umwelt 2006c: 3.1). During summer often humid, warm to hot conditions are experienced and the prevailing winds are onshore. Winter winds are offshore resulting in cool to mild, weather. Mean annual rainfall is 840 millimetres with summer and autumn the wettest seasons (Umwelt 2006c:3.1). Spring and autumn are mild with considerable rain falling in autumn due to low-scale pressure systems in the Tasman Sea (Bridgman and Oliver 1995, cited in Kuskie and Kamminga 2000:41). Autumn and winter are also a time when 'east coast lows' are most likely to develop due to the increased frequency of low pressure systems offshore. East coast lows occur on average once a year and can produce severe weather such as that experienced in the storm event which hit the Newcastle region on 8-9 June 2007 causing flash flooding (Bureau of Meteorology 2009).

In the Sugarloaf Range the effect of the June 2007 storm event is most evident in creeklines. While some disturbance to vegetation was caused by the gale force winds, the most significant impact of the storm was the very high flow of the ephemeral drainages/creeks from the Range to the lowlands located to the east and west. The morphology of the creeklines within the steep escarpment country is such that they are prone to high flow. Due to the generally high gradient of creeks/drainages and the nature of the skeletal sandy sediments and bedrock which form the creek beds, water within these creeks drains rapidly from the high points of the Sugarloaf Range resulting in stream bank erosion and the movement of sediments, leaf litter/vegetation debris, gravels within the waterflow.

Conditions in the creeks of the proposed continued underground mining area can generally be characterised as follows:

- erosion from the high flow in the headwaters of the creeks has resulted in the incision of creeklines and the clearing of accumulated sediment which has in some areas exposed rock platforms and boulders (sandstone and conglomerate);
- where flow lines/channels have resulted in sediment movement in broad creek beds located in lower relief topography at the foot of the escarpment some sandstone/conglomerate platforms have been exposed; and
- in the broad creek beds located in lower relief topography at the foot of the escarpment sediment accumulation was observed in some places, usually associated with obstacles such as fallen trees and boulders. In some instances the flow of the creek was sufficient to move such obstacles.

3.4.5 Flora and Fauna

Vegetation within the proposed continued underground mining area is typical of coastal woodlands. Six vegetation types were identified within the proposed continued underground mining area: Coastal Plains Smooth-barked Apple Woodland, Alluvial Tall Moist Forest, Coastal Foothills Spotted Gum – Ironbark Forest, Coastal Narrabeen Moist Forest, Coastal Sheltered Apple-peppermint Forest and Regeneration Area (Umwelt 2009b).

Coastal Plains Smooth-barked Apple Woodland is the predominant vegetation community occurring within the study area, covering 769 hectares. This community is characterised by the dominant canopy species smooth-barked apple (*Angophora costata*), however a wide range of other canopy species occurs with it, including red bloodwood (*Corymbia gummifera*), grey ironbark (*Eucalyptus paniculata*), broad-leaved white mahogany (*Eucalyptus umbra*), Sydney peppermint (*Eucalyptus piperita*) and spotted gum (*Corymbia maculata*).

Coastal Foothills Spotted Gum – Ironbark Forest is the second most abundant community occurring in the central-northern sector of the proposed continued underground mining area, covering 138 hectares. This community is characterised by the dominant canopy species spotted gum (*Corymbia maculata*) and grey ironbark (*Eucalyptus paniculata*). Less frequently occurring canopy species in this community include grey gum (*Eucalyptus punctata*), red bloodwood (*Corymbia gummifera*) and white mahogany (*Eucalyptus acmenoides*).

Alluvial Tall Moist Forest occurs along the creeklines on the lower slopes of the proposed continued underground mining area covering an extent of 75 hectares. Canopy species recorded within this community include turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Sydney blue gum (*Eucalyptus saligna*) and white mahogany (*Eucalyptus acmenoides*).

Coastal Sheltered Apple-peppermint Forest largely occurs in the west of the proposed continued underground mining area covering approximately 63 hectares. The community is characterised by the two canopy dominants, smooth-barked apple (*Angophora costata*) and Sydney peppermint (*Eucalyptus piperita*). Other canopy species that may occur less frequently in this community include red bloodwood (*Corymbia gummifera*) and grey gum (*Eucalyptus punctata*).

Several small remnants of Coastal Narrabeen Moist Forest occur generally along first order drainages within the proposed continued underground mining area, above the alluvial flats, covering a total of 27 hectares. Floristically, the ecotone between this community and the Alluvial Tall Moist Forest is difficult to delineate, however it is separated on geomorphological characteristics – the latter occurs in riparian areas on alluvium while the former is in the upper reaches on colluvium.

Vegetation within and around the proposed continued underground mining area has been impacted by land uses such as forestry, pastoralism/rural residential development and recreational activities such as use by off road motorcycles and 4WDs. The valley floor located to the north-west of the proposed continued underground mining area immediately above the township of Brunkerville has been extensively cleared of vegetation and utilised for agricultural activities, mostly grazing with small scale cropping (there are a small number of boutique vineyards operating in the area). Despite this, vegetation communities in the Sugarloaf Range are largely endemic and many plants known ethnographically to be used by Aboriginal people occur within the broader Sugarloaf Range area. These are summarised in **Table 3.2**. Note that all the plant species included in **Table 3.2** were observed by the registered Aboriginal stakeholders on the survey team within the proposed continued underground mining area during the fieldwork conducted for this assessment.

At the time of survey, a thick layer of accumulated leaf litter and vegetation debris limited ground surface visibility within the proposed continued underground mining area.

Table 3.2 – Aboriginal Economic Plants recorded within the Western Domain

Common and Scientific Name	Use	Reference
appleberry <i>Billardiera</i> sp.	Fruit eaten.	Low 1989:40 Zola & Gott 1992:26
banksia <i>Banksia</i> sp.	Flowers sucked as a source of nectar, smouldering cones used to transport fire.	Low 1989:170; Umwelt (2003a) Stewart and Percival 1997:13
black wattle <i>Acacia</i> sp.	Gum that exudes from wounds on trunk eaten, leaves crushed and soaked with nets to waterproof them - wood used for boomerangs, clubs and digging sticks- big fat pink witchetty grub ('Jubum') lives under tree.	Umwelt (2003a)
blady grass <i>Imperata cylindrica</i>	Food and economic plant - the grass roots were eaten by the children as sugarcane and the leaves were used for making dilly bags.	Organ and Speechley 1997: 9.
bracken fern <i>Pteridium esculentum</i>	Underground fibrous stem roasted and beaten with a stone to remove starch.	Zola & Gott 1992: 37 Threlkeld (in Gunson 1974:55)
broad-leaved paperbark <i>Melaleuca quinquenervia</i>	Economic and medicine plant - species of tea tree were used by Aboriginal people for medicinal purposes - leaves could be crushed and inhaled for coughs and colds, leaves could be soaked to make an infusion - sores and burns were washed with the leaf infusion - the bark was used for bedding and for bandages and for wrapping corpses.	Low 1990: 95. Umwelt 2003a.
cabbage tree palm <i>Livistonia australis</i>	Food and economic plant - the tip of the palm is edible - the leaves are used for roof thatch and weaving baskets – they also used the fibrous bark to make fishing lines and string.	Turbet 1989.
common reed <i>Phragmites australis</i>	Food and economic plant - roots eaten, sections of reed strung into necklaces, stems used for spear shafts.	Zola & Gott 1992: 12, 61.
cycad <i>Macrozamia communis</i>	Initially poisonous the seed of the Cycad are treated to leach toxins then used to make flour.	Botanic Gardens Trust (undated)
fig <i>Ficus</i> sp.	Fruit eaten.	Low 1989: 22
flax lily <i>Dianella caerulea</i>	Blue berries edible raw, seeds inside can be chewed and are nutty in flavour, leaves split and used for weaving, base of leaves edible, roots edible after pounding and roasting, whistle that attracts birds can be made from base of leaves.	Low 1989:8 Umwelt (2003a) Stewart and Percival 1997:24
fringe lily <i>Thysanotus tuberosus</i>	Small sugary tubers eaten.	Low 1989: 112-113
geebung <i>Persoonia</i> sp.	Broad and narrow leaf Geebung present in the proposed continued underground mining area - fruit eaten.	Zola & Gott 1992: 35
grass tree <i>Xanthorrhoea</i> sp.	Resin used for hafting stone tools, flowering stems used for spear shafts, base of the leaves are sweet and nutty; nectar collected from the flower spike.	Low 1989: 130; Zola & Gott 1992:58- 59 Umwelt 2003a

Table 3.2 – Aboriginal Economic Plants recorded within the Western Domain (cont)

Common and Scientific Name	Use	Reference
gum tree <i>Eucalyptus</i> sp.	The bark of some species was used to make shields and bowls, the leaves and sap were used to make inhalants and washes for sores and green leaves were used to 'smoke' people for various ailments.	Umwelt 2003a
gynea lily <i>Doryanthes excelsa</i>	Stem cut when young and roasted; roots roasted, pulverised and made into 'cake'.	Umwelt 2003a
headache vine <i>Clematis glycinoides</i>	Crushed leaves inhaled for headache.	Low 1990: 226
kangaroo grass <i>Themeda</i> sp.	Seeds ground for flour. Leaves and stem used for fibre, Aboriginal women from the Kimberley visiting MLALC made baskets from this grass May 2001.	Greenway 1910:16 Zola & Gott 1992:58 pers. obs. 2001
lilly pilli <i>Syzigium paniculatum</i>	Sweet fleshy fruit of many different types of lilly pilli were eaten raw.	Botanic Gardens Trust (undated)
matt rush <i>Lomandra</i> sp.	Long pliable leaves used for weaving baskets, leaf bases and flowers edible.	Low 1989: 131, 174; Zola & Gott 1992:59
mistletoe <i>Amyema</i> sp.	Berries eaten.	Low 1989:14; Zola & Gott 1992:54
mountain devil <i>Lambertia formosa</i>	Nectar sucked from flowers.	Low 1989: 170
native cherry <i>Exocarpus cupressiformis</i>	Enlarged succulent stalklet (pedicel) eaten.	Low 1989: 46
native grape <i>Cayratia clematidea</i>	Fruit eaten.	PlantNet (1999-2009)
rock lily <i>Dendrobium speciosum</i>	Starchy stems were eaten raw or roasted.	Botanic Gardens Trust (undated)
rushes and sedges <i>Juncus</i> , <i>Carex</i> & <i>Cyperus</i> sp.	Underground stem or tuber can be eaten in some species, leaves used for weaving.	Low 1989:105; Zola & Gott 1992:60
sarsaparilla <i>Hardenbergia violacea</i>	Medicine plant - the leaves of the plant are crushed and then sucked or mixed with water and taken as an elixir for stomach ache.	Umwelt 2003a.
smooth-barked apple <i>Angophora costata</i>	Economic and medicine plant - burls removed and hollowed out to make bowls which could be heated over the fire to boil water - the Aboriginal oral history states that the water would boil before the bowl burnt - the leaves and sap were used for inhalants, washes for sores and diarrhoea.	Australian National Botanic Gardens Education Services 2000: 21. Umwelt 2003a.
wombat berry vine <i>Eustrephus latifolius</i>	Small sugary tubers eaten.	Low 1989: 17

A total of 112 vertebrate fauna species were recorded within the proposed continued underground mining area during the ecology surveys, comprising 33 mammal species, 68 bird species, five reptile species and six amphibian species (Umwelt 2009b).

Thirty three mammal species from 13 families were recorded within the proposed continued underground mining area during the survey effort. The most common mammal species recorded that are known to have been hunted by Aboriginal people were red-necked wallaby (*Macropus rufogriseus*), common brushtail possum (*Trichosurus vulpecula*) and the grey-headed flying-fox (*Pteropus poliocephalus*) (Umwelt 2009b).

None of the bird species recorded within the proposed continued underground mining area are known from ethnographic records to have been hunted, however, their eggs are likely to have been collected for food. Similarly none of the amphibious species recorded within the proposed continued underground mining area are known to have been used as food sources. Goannas or Lace Monitors (*Varanus varius*) were recorded during the survey. Goannas were a prized food resource.

Freshwater crayfish claws (*Cherax destructor*) were noted during prior archaeological survey. It is probable that these represent another source of food available within the proposed continued underground mining area or its near environs.

It is recognised that the current economic faunal species available within the proposed continued underground mining area may not represent the diversity available in pre-contact times or within the broader Sugarloaf Range area and that Aboriginal people utilising the proposed continued underground mining area also had access to marine resources along the coast and inland riparian and swamp environments within a day's walk.

Termite mounds were also observed during the survey period. The centre of termite mounds was used by Aboriginal women to treat stomach ache and diarrhoea (Low 1990:28, 119, 120). Termite mounds were also used as a source of pigment (for more details refer to **Section 5.2.3**).

3.4.6 Historic Land-Use

Historic land-use acted to displace Awabakal people and to restrict and deplete their access to valuable economic and social resources such as those within the Sugarloaf Range (refer to **Section 3.0 Part A** for more detail on the cultural perspective). In terms of the landscape, the main physical impact within the proposed continued underground mining area from historic land-use relates to timber cutting. The demand for timber in the Lake Macquarie area increased with the establishment of coal mining and the construction of the Newcastle rail link in the 1880s. With the advent of coal mining, much of the timber cut from the Sugarloaf Range was supplied to the local underground mines for pit props and the developing rail networks resulted in a high demand for sleepers. In 1889 Tomas Barnier established a sawmill in the Mount Vincent area (to the north of the proposed continued underground mining area) and cut and milled timber from the Sugarloaf Range and the Watagan Mountains. Timber was taken off the mountain by bullock teams and delivered to the site of a new colliery, rail line, rail bridge or building as required. Following the opening of the Awaba Railway Station in August 1887 timber was also delivered direct to the station for transportation further afield (Suters Architects Snell 1993:22).

Management for the production of timber for mining resulted in trees above pit prop size/not suitable for pit props, being removed and regrowth being harvested before it grew beyond optimum sizes (DECC 2008:2). Tracks were constructed along ridges and spur crests to allow removal of the timber.

As a result of timber getting activities:

- numerous formed and unformed tracks were constructed along spur and ridge crests in the Sugarloaf Range area as these supplied the most easily navigable travel routes;
- the A1 and most of the A2 soil horizon has been lost from the crests and slopes (along with any Aboriginal archaeological material it may have contained) and redeposited in the low gradient valleys where it may act to bury Aboriginal archaeological sites/archaeological material; and
- due to cumulative impact a very high percentage of the mature trees have been removed, greatly decreasing the likelihood of locating scarred or carved trees.

In more recent times the major impact to the Sugarloaf Range area is from recreational 4WD enthusiasts, off road motor bikes and rubbish dumpers.

3.5 Implications of the Physical Context of the Proposed Continued Underground Mining Area for Aboriginal Site Location

The geology of the Sugarloaf Range indicates that the area could contain a variety of Aboriginal archaeological site types requiring particular geological conditions. As noted in **Section 3.4.3**, the ridgetops and upper slopes of the Sugarloaf Range contain Narrabeen Group sandstone. This sandstone can occur as flat expanses (platforms) and can be selectively weathered to create shelters in cliffines and under boulders. Sandstone platforms were known to have been used for the grinding of axes (usually associated with a water source) and as a surface for the production of engraved and abraded art. Shelters are known to have been used by Aboriginal people for the production of rock art, as temporary habitations and some have mythical associations to Dreaming stories (Maynard 1979, Vinnicombe 1980, McDonald 2007). These site types are known to have high Aboriginal cultural value (refer to **Section 3.0 Part A**).

The flora and fauna of the proposed continued underground mining area would have provided a variety and seasonality of highly valued resources useful to small groups of Aboriginal people. These resources would have attracted people into the Sugarloaf Range and provided opportunities for Awabakal people to stay in the high country for short to medium term periods of time.

The topography of the area would have provided access to and from the steep ridgelines of the Sugarloaf Range eastwards to the gently undulating foothills and swampy flats of Wakefield and the Diega Flat. At a broader scale access from the Hinterland to the east and valley floor to the west via ridgelines, spurs and secondary spurs would have allowed Awabakal people to negotiate the steep escarpment country using the main Sugarloaf Range Ridge to access the swamp country of the Beresfield and Hexham areas to the north (refer to **Section 3.0 Part A** for further details of Aboriginal pathways) and the Watagans Ranges, ultimately providing passage as far as Yengo National Park and the Blue Mountains to the south-west. These routes would also have provided access to visitors from other groups sanctioned by the Awabakal to come into the area to trade and exchange goods.

The Narrabeen Group geology of the proposed continued underground mining area may have provided a suitable context for the production of site types such as axe grinding grooves, rock art sites (horizontal platform engravings/pecking and/or shelters containing pigment/engraved art) and rockshelters that may have been used by Aboriginal people as temporary habitations.

Basalt for the manufacture of stone implements may be locally available as cobbles within streambeds in the Sugarloaf Range and quartz and quartzite may have been available from local conglomerates.

The extreme storm experienced in June 2007 has altered the sediment loads in creeks and increased erosion in ephemeral drainages and watercourses not constrained by bedrock. This may mean that sandstone platforms/creekbeds not previously visible during earlier survey within the proposed continued underground mining area could now be visible. The storm may also have increased erosion in areas of disturbance such as vehicle tracks and earthworks exposing previously buried artefactual material (graded unsealed roads). Increased erosion and high flow from drainages/creeks may mean that there is increased sediment deposition at the foothills of the Sugarloaf Range which may act to bury/conceal artefactual material. Thus further survey of previously surveyed areas may reveal new sites and/or loss of previously recorded sites.

Timber getting activities have resulted in loss of mature trees reducing the likelihood of locating Aboriginal scarred/carved trees. The removal of the trees by timber cutting has also resulted in the construction of tracks along the most navigable routes through the range country and thus may have uncovered/destroyed evidence of Aboriginal use of these travelways. Finally tree clearance would have initiated a massive loss of topsoil (and any archaeological material it contained) and its relocation to the valley floors.

Section 3.0 Part C

3.6 Ethnographic and Archaeological Context

Please note that this section provides background information about ethnographic and archaeological context of the Sugarloaf Range area and does not provide the information in relation to Aboriginal cultural values or perspectives. This information is provided by the registered Aboriginal stakeholders in **Section 3.0 Part A**.

3.6.1 Ethnographic Context of the Proposed Continued Underground Mining Area

Historic records, such as official records, personal observations recorded in diaries or publications and paintings, can provide rare information on Aboriginal lifestyles of a region at the time of European contact. Although a valuable source of information, the limitations of these documents must be recognised as colonial observers generally tended to record unusual rather than everyday events, religious and social life rather than economic activity, and men's behaviour rather than that of women and children. As such, ethnohistoric records are neither unbiased nor complete, and they cannot provide a complete understanding of Aboriginal lifestyles at the time of contact.

The Sugarloaf Range is within the traditional country of the Awabakal people. Although several different versions of Awabakal tribal boundaries have been documented in the past, it is generally understood that Awabakal country extended south from the Hunter River to Norah Head and Wyong, and extended west to include the Sugarloaf and Watagan Ranges. The traditional country of the Awabakal people was bounded to the north by the Worimi, to the west by the Wonnarua, to the south-west by the Darkinjung and to the south along the coast by the Kurring-gai people. Although separate tribes, early authors such as Threlkeld (a missionary in the Lake Macquarie area from 1825 to 1841) recognised the relationships between Aboriginal countries, stating that *'the natives here are connected in a kind of circle extending to the Hawkesbury and Port Stephens'* (Threlkeld 1825 in Gunson 1974).

3.6.1.1 Scarred Trees (bark removal)

Early settlers would have been unaware of the Aboriginal cultural significance of scarred trees in the region, and the movement of timber cutters through the region would have resulted in the destruction of the majority of these site types which are now assessed as being culturally significant. In addition, some authors have noted the brutal behaviour of early timber cutters towards Aboriginal people, particularly women (Bramble 1981:37), which is likely to have provided a powerful motive for retaliation. Tensions between Aboriginal people and timber cutters are well documented, for example, in November 1804 Governor King suspended operations of private cedar parties following 'a party of Natives being beaten on Paterson's River'. Aboriginal attacks on timber cutting parties are also recorded, with cedar cutters often being accompanied by a guard, both to prevent escapes and to protect them from attack (Bramble 1981:32).

Early descriptions of Aboriginal huts or 'gunyers' made from the bark of trees include the following:

- Collins (1798 in Fletcher 1975) described huts of the Aboriginal people being made of the bark of a single tree, bent in the middle providing shelter for one tenant. Collins further noted that bark was never carried around, for whenever we found a hut, we found the tree from which it had been taken;
- Dawson (1830) describes huts made with three sticks and Melaleuca bark;
- Threlkeld (in Gunson 1974:45) described sleeping places being erections of boughs of trees, with sheets of bark placed upright supported by stakes; and
- Turner and Blyton (1995:15) note that huts were made from stringybark or box bark;

Threlkeld (in Gunson 1974:3) also describes coastal huts as being more substantial than inland huts. Collins (1798 in Fletcher 1975) also comments on this, noting that on the sea coast, huts were larger and formed of pieces of bark from several trees put together, and were large enough for six to eight people. Both Threlkeld (in Gunson 1974:45) and Collins (1798 in Fletcher 1975) also described individual fires at the mouth of each hut.

3.6.1.2 Subsistence

Consumption of specific foods appears to have been restricted by age and gender, for example, Threlkeld (in Turner and Blyton 1995:14) recorded that large lizards were a favourite item of the privileged class, and that snakes and wild dogs were considered a dish fit for a king.

Historical accounts identify that a range of land animals were part of the Aboriginal diet at the time of contact, including kangaroos, reptiles, bandicoots and emus. Brayshaw (1986) identifies that animals were sometimes speared by an individual huntsman (such as observed by Dawson 1830:17) but hunting was more frequently a group exercise. Threlkeld (in Gunson 1974:191) observed a hunting expedition in Lake Macquarie and described it as follows:

We mustered about thirty persons armed, with spears. After traveling a few miles, we arrived at the top of a high hill, the party separated, some going to the bottom, while we continued to the top. A deep valley was before us. The men arranged themselves in different parts, on rocks or stumps, or any little eminence waiting the appearance of game, which the party below, women chiefly, alarmed by their shouts. Seven or eight animals were obtained in less than two hours.

Another description of a hunt – of bandicoots – is also described by Threlkeld (in Gunson 1974: 54) as:

...with the weapon of warfare they beat about every high grassy bushy place. The dogs hunting around likewise. The moment an animal appeared they threw their waddies at it and generally killed it at one blow. One man stood on the stump of a tree, and threw a spear with the greatest precision transfixing a Bandicoot to the ground...

A c.1820 depiction of a party hunting kangaroos by Joseph Lycett (refer to **Figure 3.3**) shows a similar scene, with a large party of men positioned high in a valley, using fire and weapons to drive kangaroos out in the open.

3.6.1.3 Implements

Accounts with specific or detailed references to implement types and raw materials are sparse. Kuskie and Kamminga (2000 Volume A: 68-69) compiled the following references:

- Threlkeld (in Gunson 1974:67) and Barrallier (1802:81 in Brayshaw 1986)) mention the use of quartz to form the serrated edges of fighting or 'war' spears.
- Threlkeld (in Gunson 1974), Barrallier (1802) and Dawson (1830) all observed stone hatchets ('*baibai*', '*pukko*' in Awabakal). Dawson observed that the grooved heads were fastened to a handle by adhesive gum obtained from wattle (*Acacia spp*) and that the stone from which hatchets were made was basalt or diorite ground on sandstone to form a bevelled cutting edge. Matthews (1894) noted the uses of hatchets as being to cut saplings and strip bark from trees and to cut notches in trees for climbing particularly toe holds to procure animals from hollows or honey from bees' nests (Umwelt 2003c).
- Dawson (1830) and Brayshaw (1986) note the use of shells as scrapers to sharpen wooden implements (Umwelt 2003c).

There is an account of a very large stone axe being handed to the anthropologist W. J. Enright by a European settler in the Newcastle area. The axe is reported to have been from a farm near Tarro (in the Beresfield area, some 7-10 kilometres north-east of the proposed continued underground mining area). The axe is described as weighing 7lbs and having the dimensions 10 inches long, 8 inches wide and 3 inches thick. The axe was made of fine-grained quartzite (*Mankind* 1932 in Hartley 1995:88).

Threlkeld provided the following description of the manufacture of a fishing spear at Lake Macquarie, made from the stem of the grass tree:

...there are four pieces of hard wood about two feet long, [which] are fastened with a bark-thread covered with the grass-tree gum, heated in the fire until at melting point, when it is worked round the thread fastening it... The three or four shorter spears thus fastened to the long stem of the grass tree, of about six feet length, becomes thus somewhere nigh eight feet in the total length of the weapon. Small wooden wedges are inserted betwixt the attached short spears just at their base where they are tied and likewise gummed over firmly ... The point of each skewer is hardened in the fire, by charring; and when hot, covering it with a coating of the grass - tree gum, fastening at the same time a barb of bone at the point.

Turner and Blyton (1995:19) describe implements used by Aborigines at the time of contact, such as a stone axe fitted to a shaft taken from the *Xanthorrhoea* plant; wooden coolamons used for carrying water and small sheets of stringybark tied at each end that had a twig as a handle and which were used for holding water. Other general equipment described by authors include: forked poles for climbing trees (Dawson 1830); nets and bags for carrying



FIGURE 3.3

Aboriginal people using fire to hunt kangaroos —
Joseph Lycett c.1820

food and equipment (Ebsworth 1826, Dawson 1830); string made from bark (Ebsworth 1826, Dawson 1830); gum and resin from *Acacia* and *Xanthorrhoea* plants; tea tree bark for small baskets and water vessels; and the shank bone of a kangaroo used as an awl (Threlkeld in Gunson 1974:54).

Hardwood implements used by women were also described, but records are generally rare due to the focus on weapons rather than mundane domestic artefacts. Yamsticks were used for daily sourcing of food, and could be up to two metres long and about four centimetres in diameter. Yamsticks were fire-hardened but usually not decorated, but also were status symbols sometimes also used as weapons during altercations (Brayshaw 1986).

Cord and string were all purpose items usually made from the bark of various trees, including the cabbage-tree, kurrajong and hibiscus (Threlkeld in Gunson 1974:191), and used for fishing lines, nets, binding and so on. Ebsworth (1826:79) provided the following description of how the women made string from bark:

...they twist and roll the bark in a curious manner with the palm of the hand upon the leg; with this string they form nets of curious workmanship. In some the meshes are very small and neat, and the whole knit without a knot, excepting at its completion.

Dawson (1830:250) indicated that tea tree bark was sometimes used to make small baskets, but that it was used by folding and tying it in a peculiar manner for drinking vessels more frequently than for anything else. Threlkeld (in Gunson 1974:67) described similar drinking vessels used at Lake Macquarie as '...sheets of bark which are tied up at each end, and a bent twig forms the handle'. He also noted that wooden bowls were taken from large protuberances of growing trees which they chopped with stone or iron hatchets.

Threlkeld (in Gunson 1974:67) described three kinds of spears in use at Lake Macquarie; the fishing spear, the hunting spear and the war spear. Although manufacture of the war spear was similar to manufacture of hunting and fishing spears described in the above section, war spears only had one joint of hardened wood fixed to the end. This spear could be from fourteen to eighteen feet long (Threlkeld in Gunson 1974:190; Barrallier 1802:81) also noted the spears to be of this length. War spears often also had the addition of pieces of sharp quartz stuck along the hard wood joint on one side so as to resemble the teeth of a saw. Threlkeld (in Gunson 1974:64-66) noted that bone points were fixed to some spears, and also that the use of glass instead of quartz to barb the war spears resulted in their inflicting terrible lacerations. Spears for all purposes appear in the Hunter region to have been of composite manufacture, usually comprising lengths of grass tree (*Xanthorrhoea australis*) to which were affixed points of hard wood.

Several types of clubs have also been described in the Hunter coastal region, all of hard wood (Brayshaw 1986). One, usually called a 'waddy', and was described by Dawson (1830:66) as '....like a large kitchen poker, and nearly as heavy, only much shorter in the handle' or by Threlkeld (in Gunson 1974:54) as '...a short stick like a constable's staff only tapering from the middle to the end'. It was generally made of ironbark wood (Ebsworth 1826:77). Waddies were used for hunting, but were also observed being used in battle or single combat when the offence was slight and it was not wished that any of the parties should be killed (Lang Papers 1815:61). The same source indicated that a heavier club, sometimes referred to as a 'nulla nulla', was employed when the offence had been greater, death sometimes but not often ensuing from its use. The 'nulla nulla' appears to have been a mushroom-like club with a flattish circular head.

Threlkeld (in Gunson 1974:68) described an instrument of warfare which he termed a 'wooden sword', not unlike a boomerang but with 'a handle at one end with a bend contrary to the blade'. He thought the difference of shape between the sword and the boomerang

was 'only an accidental circumstance arising from the natural growth of the tree whence the wooden sword was taken'.

Boomerangs were recorded as made of hardwood, ironbark and myrtle (Breton 1833:237). Browne (in Brayshaw 1986) described the boomerang as being used to 'disperse a crowd'. Threlkeld (in Gunson 1974:69) implied that the same instrument was used as either a source of entertainment or of destruction, thrown at man or beast.

3.6.1.4 Trade and Exchange

Some early authors also note the trade links between the Awabakal and inland tribes. Threlkeld (in Gunson 1974:42) notes that coastal grass trees provided suitable material for spear manufacture, and were often sent into the interior in exchange for possum skin rugs and fur cord. Threlkeld (in Brayshaw 1986) reported that in the winter of 1826, Biraban went to the mountains with upwards of 60 spears to exchange for cord made of opossum fur. Haslam (1985) also suggests that tuff found at Newcastle was also traded, as it has been reputedly found in the Moreton Bay area, the Hunter region and the Watagan Mountains.

Brayshaw (1986:63-64) described shields in the Hunter region being made of both wood and bark. Threlkeld (in Gunson 1974:68) described a shield used at Lake Macquarie as being made from a buttress of the nettle tree or the giant fig tree, and usually about three feet long by eighteen inches, or so at most; lozenge-shaped, pointed at top and bottom, and pigeon-breasted rather than flat. The thickness in the centre may be an inch, not more, and thins off to about a quarter of an inch to the edge. On the inside of the shield, in the centre, a piece of tough wood is bent and inserted like the handle of a basket, just sufficiently large to hold by, and a soft piece of tea tree-bark is fixed on which to rest the knuckles and preserve them from abrasion.

3.6.1.5 Ceremony in the Region

Ethnohistoric accounts note a number of locations to the north-east of the proposed continued underground mining area as being associated with the customary practices of the Awabakal. The *Wallsend and Plattsburg Sun* (3 January 1891:3) reports the location of 'man-making' (initiation involving the practice of tooth evulsion) and marriage ceremonies as being performed at the 'Doghole...a couple of miles from Minmi', the area currently known as Stockrington (Umwelt 2003c: 5.14). The *Wallsend and Plattsburg Sun* (13 December 1890:3) also reports the location of a place where large numbers of people gathered, a Corroboree Ground, in the vicinity of Nelson and John Streets, West Wallsend at the foot of the Sugarloaf Range (Umwelt 2004c: 2.8).

3.6.1.6 Mythological Associations with the Sugarloaf Range

The Sugarloaf Range is the purported home of a monster man named Puttikan (Gunson 1974:61):

...[there] is a being, in the Sugar-Loaf Mountains, resembling a man but taller in stature; with arms, legs. Face and hair, very long on the head, but the feet are placed contrarily to the face being behind; and the body hairy, like an animal. The flesh is so hard that in all parts of the body that it is impenetrable, except just behind the legs where a spear may penetrate, but at no other part. He is fierce devouring men, and often pursuing the Aborigines in the mountains.

3.6.1.7 Burials

References to burial places are made in a number of documents. In the Newcastle Sun, 23 April 1924, in an article entitled 'Fifty Years of Progress: Memorable Days in Wallsend's

History' reference is made to a burial ground '...in the vicinity of Maryland, Glendor and Stles' (sic) Grove...but the signs of it have long since passed away' (Umwelt 2003c: 5.14).

In the freshwater section of Cockle Creek at Killingworth (adjacent to the proposed continued underground mining area), 100 burials have been reported. The 100 burials were reported to have been marked by stone arrangements which have since been destroyed (Umwelt 2004c:2.7).

3.6.2 Previously Recorded Aboriginal Sites

A number of Aboriginal cultural heritage and archaeological assessments have been conducted within the proposed continued underground mining area and immediate surrounds, including assessments pertaining to previous phases of the WWC. A search of the DECCW Aboriginal Heritage Information Management System (AHIMS), the NSW register of Aboriginal sites, was conducted between MGA 356 000 - 367 000 east and 6358 000 - 6345 000 north to gain an understanding of the distribution of Aboriginal archaeological sites in the broader Sugarloaf Range area and within the SSCA. A total of 62 recorded Aboriginal sites are registered within the search area. The AHIMS results are summarised in **Table 3.3** (please note that the full AHIMS search result has not been appended at the request of participating registered Aboriginal stakeholders). DECCW also advises that the AHIMS register cannot be guaranteed to be free from error and currently has a program of site verification underway to address some of these inaccuracies.

**Table 3.3 - Summary of AHIMS Registered Aboriginal Sites
MGA 356 000 - 367 000 east and 6358 000 - 6345 000 north**

AHIMS Site Type	Site Features	Number of Sites
Artefact	Number and types of artefacts (stone, bone, shell, wood, glass ceramic) unknown. Note these sites are usually isolated stone artefacts – Isolated Finds or Artefact Scatters.	19
Open Campsite	Artefact Scatter – multiple stone artefacts	14
Axe Grinding Groove	Site containing an unknown number of grooves resulting from the production and resharpening of edge ground stone axes.	24
Axe Grinding Groove and Water Hole/Well	Site containing an unknown number of grooves resulting from the production and resharpening of edge ground stone axes in association with a water hole or 'well' feature	1
Axe Grinding Grooves, Shelter With Deposit	Site containing an unknown number of grooves resulting from the production and resharpening of edge ground stone axes in association with a rockshelter that has been assessed as containing deposit likely to contain archaeological evidence.	1
Art	Rock art site containing an unknown number of motifs. Technique unknown (may be pigment or engraved art). <i>Please note that site has been incorrectly entered into the DECCW/AHIMS register as a rockshelter with art. It is actually a grinding groove site with a possible engraved macropod (kangaroo or wallaby) footprint.</i>	1
Tree	Scarred or carved tree	1
Potential Archaeological Deposit (PAD)	Deposit (soil profile) assessed as being likely to contain archaeological evidence.	1
Total		62

Table 3.3 includes previously recorded sites that occur within six kilometres of the centre of the proposed continued underground mining area. These sites and other sites located in the broader area known from earlier DECCW AHIMS site searches (undertaken for other projects) appear on **Figure 3.4**. **Figure 3.5** shows the proposed continued underground mining area and immediate surrounds, an area of approximately 42 square kilometres centred on the proposed continued underground mining area. **Figure 3.5** therefore shows only those previously recorded sites within or in very close proximity to the proposed continued underground mining area. As shown on **Figures 3.4** and **3.5**, 13 previously recorded sites are registered within the proposed continued underground mining area; three grinding groove sites, five isolated finds, four artefact scatters and the Western Domain 5 site (wet soak and associated artefact scatter). In relation to the grinding groove sites, during the survey undertaken for this project (refer to **Section 5.0**) it was noted that grinding groove site #38-4-0462 had not been accurately mapped when initially located and that it is actually located outside the proposed continued underground mining area (for details refer to **Section 5.3.2.9**). **Figures 3.4** and **3.5**, however, indicate the location of the site according to the DECCW/AHIMS database. DECCW will be informed of all inaccuracies noted in the AHIMS database.

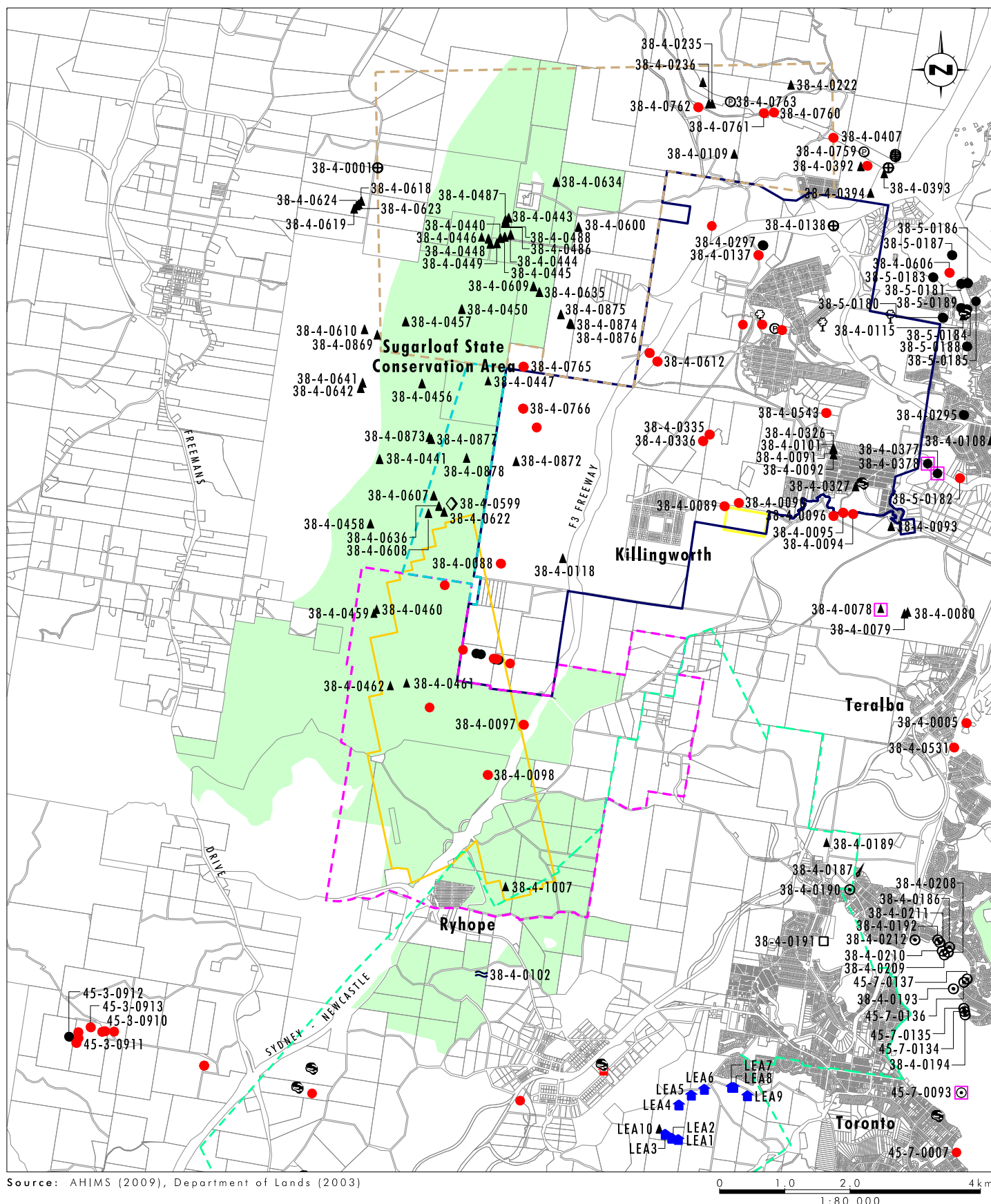
Figure 3.4 indicates that there are 30 grinding groove sites on the DECCW/AHIMS register within the broader Sugarloaf Range area and within the SSCA that are outside the proposed continued underground mining area (one of these [#38-4-0599] is recorded as having a possible associated engraving of a macropod print). The figure also indicates that there is only one artefact scatter site within the SSCA outside the proposed continued underground mining area. There are no stone arrangement sites registered on the DECCW/AHIMS in the SSCA though there are three stone arrangement sites registered within the Sugarloaf Range to the north (2) and to the west (1) of the SSCA. There are no rockshelters or scarred trees recorded within the Sugarloaf Range or the SSCA, however, these sites are represented in the general area (11 rockshelters to the south, and three scarred trees to the north-west of the proposed continued underground mining area).

Where information from previous archaeological assessments is available in relation to the grinding groove, stone arrangement and scarred tree sites, it is included in **Section 3.7**. However, for some sites the only information available was from the site cards and these details have been included in **Sections 3.6.2.1** to **3.6.2.3**. Tables with further information reviewed in relation to grinding groove, rockshelter and stone arrangement sites shown on **Figure 3.4** are included in **Appendix D**.

3.6.2.1 W. T. Bluff 1990 to 2002

W. T. Bluff is an amateur archaeologist and has been instrumental in recording 54 of the 99 grinding groove sites registered within the Sugarloaf Range area as shown on **Figure 3.4** and outlined in **Appendix D**. Thirty-one of these sites are located within the SSCA. The information supplied within this section of the report has been obtained from the DECCW site cards completed by Bluff between 1990 and 2002. There are no reports associated with the sites and no details of the dimensions of the grooves. During the survey for this project it was also noted that there were some inaccuracies in the GPS coordinates registered for Bluff's sites. This is to be expected as Bluff was recording in a period prior to the US government removing blocks on satellite reception which produced inaccuracies in readings. It is also very difficult in such heavily vegetated and steep terrain to obtain sufficient satellite coverage for accurate readings. Where inaccuracies were observed for sites rerecorded as part of the current assessment, new site cards have been prepared which will be supplied to the DECCW.

Two of the grinding groove sites (#38-4-0461 and #38-4-0462) recorded by Bluff are within the Bangalow Creek catchment on the western fall of the Sugarloaf Range and are registered as being within the proposed continued underground mining area (refer to



Source: AHIMS (2009), Department of Lands (2003)

Legend

- Continued Underground Mining Area
- West Wallsend Colliery Pit Top Facility
- CCL725 Lease Boundary
- CCL718 Lease Boundary
- ML1451 Lease Boundary
- Tasman Mining Lease Boundary
- Newstan Mining Lease Boundary
- Conservation Area
- Destroyed Site
- Artefact Site - Type Not Specified
- Shelter with Art
- Shelter with Deposit
- Stone Arrangement
- Grinding Groove and Possible Art
- Potential Archaeological Deposit
- Natural Mythological Site (Ritual)

- Axe Grinding Groove / Shelter with Deposit
- Axe Grinding Groove / Water Hole (Well)
- Artefact Scatter (Open Camp Site)
- Scarred Tree or Carved Tree
- Isolated Find
- Midden
- Axe Grinding Groove / Art
- Axe Grinding Groove

FIGURE 3.4

Previously Recorded
Aboriginal Archaeological Sites

Previously Recorded Aboriginal Sites within the Continued Underground Mining Area and Environs

Figure 3.5), while another three of these sites (#38-4-0458, #38-4-0459 and #38-4-0460) are registered within the Bangalow Creek catchment, approximately 200 metres west of the proposed continued underground mining area (refer to **Figure 3.5**).

Site #38-4-0461 was recorded as having four axe grinding grooves on a sandstone platform in the creek bed next to a pot hole. At the time of recording Bluff indicated that there may be further grooves in the creek bed which were obscured by moss and leaf litter. Site #38-4-0462 is recorded as having 16 axe grinding grooves on a sandstone platform above a waterfall in the creek bed. At least 10 of the grooves were located near the edge of the platform. Bluff recorded minimal moss obscuring the sandstone, indicating he thought it unlikely that there would be additional grooves. The #38-4-0641 and #38-4-0642 grinding groove sites were rerecorded in 2009 during the current survey and further detail in relation to the sites is provided in **Sections 5.3.2.8 and 5.3.2.9**.

Site #38-4-0458 was recorded as seven axe grinding grooves in the bed of a tributary of Church Creek associated with a number of depressions that did not appear natural. The grooves were reported by Bluff as located near the edge of a short terrace. There was a moderate amount of leaf cover along the creek bank associated with the site. Site #38-4-0459 was located on a tributary of Bangalow Creek and was recorded as 28 axe grinding grooves on a sandstone platform in the creek bed. The creek bed around the area with the grooves was covered by heavy leaf litter at the time of recording, which Bluff reported may have obscured further grooves at the site. From the photos available with the site card, the creek bank looks steep and has dense vegetation which suggests there is low potential for PAD associated with the site. Site #38-4-0460 (also on a tributary of Bangalow Creek) consisted of seven axe grinding grooves on a sandstone platform in the creek bed. The site was covered by a moderate amount of moss and leaf litter which Bluff reported may have obscured further grooves at the site. Two of the grooves were adjacent to the edge of a large oval pothole.

Other grinding groove sites recorded by Bluff in other catchments in the Sugarloaf Range include; #38-4-0115 (25 grooves in four clusters; a rerecording), #38-4-0187 (one groove on a conglomerate boulder), #38-4-0189 (three grooves), #38-4-0222 (10 grooves), #38-4-0235 (two grooves), #38-4-0326 (39 grooves), #38-4-0327 (13 grooves) #38-4-0438 (10 grooves), #38-4-0441 (50 grooves on three levels), #38-4-0443 (two grooves), #38-4-0447, #38-4-0450 (15 grooves in three clusters), 38-4-0452 (13 grooves), 38-4-0456 (nine grooves), 38-4-0457 (11 grooves), #38-4-0486, #38-4-0487, #38-4-0488, #38-4-0599 (three grooves possibly associated with an engraving), #38-4-0600, 38-4-0607 (five grooves), #38-4-0609 (six grooves), 38-4-0610 (seven grooves in three clusters), #38-4-0618, #38-4-0619, #38-4-0622 (one groove at the top of a waterfall), #38-4-0623, #38-4-0624, #38-4-0634, #38-4-0635 (six grooves and two 'dugouts'), #38-4-0636 (one groove) #38-4-0641 (33 grooves), #38-4-0642 (three grooves), #38-4-0869 (10 grooves), #38-4-0872 (11 grooves), #38-4-0873 (two grooves), #38-4-0874 (two grooves), #38-4-0875 (six grooves), #38-4-0876 (20 grooves), #38-4-0877 (two grooves), #38-4-0878 (seven grooves), #45-3-1934 (six grooves) and #38-4-0608 (eight grooves) (refer to **Figure 3.4**).

In 2003, as part of the background research associated with the preparation of the LMCC ACHMP, Umwelt (2009a), rerecorded six of the grinding groove sites previously recorded by Bluff, which were located on Mount Sugarloaf within the Tasman ML (refer to **Figures 1.2 and 3.4**). These sites are situated on the north-western fall of the Sugarloaf Range, in the upper reaches of Surveyors Creek. In total this cluster of six sites contained approximately 120 grooves. The Surveyors Creek grinding groove sites are described below.

Bluff recorded 54 grooves over five sandstone terraces in 1997 in site #38-4-0440. In 2003 Umwelt rerecorded the site and observed 72 grooves over the five sandstone terraces. At the time of Umwelt's recording there was pooled water adjacent to all of the clusters of grinding grooves. After the fifth terrace there is a large steep drop into a pool below. One of

the terraces (terrace 4) had no grooves, most likely as no water was recorded pooling in this location. The dimensions of the grooves recorded indicated that adzes, hatchets, axes and large axes were ground and resharpened at the site (refer to **Section 5.3.2** for a description of the criterion used for determining the types of implements being ground based on groove dimensions).

Site #38-4-0444 was recorded by Bluff in 1997 and rerecorded by Umwelt in 2003 as containing 12 grinding grooves. The grooves were recorded in two clusters, one with three grooves and the other with nine grooves. The cluster of nine grooves was adjacent to a pool of water, while the cluster of three appeared to be where water first flows down the creek after rain. The dimensions of the grooves recorded indicated that adzes, hatchets and axes were ground and resharpened at the site. One groove had a length that suggested it may be two grooves end to end that had merged together. The creek bank to the south was recorded as being a 'flat grassy bank' suggesting that the grooves may have PAD associated with them.

Site #38-4-0445 was recorded by Bluff in 1997 as having 24 grinding grooves and rerecorded by Umwelt in 2003, with 21 grooves visible at that time. To the north of the sandstone platform with the grooves was a large pool, at the bottom of a five metre drop. The banks of the creek were characterised by boulders and rock shelves. The grooves were in two clusters around the single pool of water. Nineteen of the grooves were to the north of the pool, and the remaining three that were visible in 2003 were to the west of the pool.

Bluff recorded site #38-4-0446 as having 15 grooves in the creek bed. In 2003 Umwelt rerecorded the site as having eight grinding grooves located at the edge of a sandstone platform at the bottom of a 15 metre steep drop. Six of the grooves were on the edge of a 60 to 70 centimetre wide ledge in the sandstone. The dimensions of the grooves suggested that hatchets and large axes were being ground at the site.

Site #38-4-0448 was recorded by Bluff in 1997 and Umwelt in 2003 as having three grooves in the sandstone creek bed. The dimensions of the grooves suggested that axes were being ground at the site. The sandstone bed was heavily covered with moss, and it was noted that this may be obscuring further grooves.

Site #38-4-0449 was recorded by Bluff in 1997 and Umwelt in 2003 as having seven grooves in the sandstone creek bed. The dimensions of the grooves suggested that adzes and hatchets were being ground at the site.

W. T. Bluff was contacted (13 January 2010) in order to determine how widely he had actually investigated the Sugarloaf Range area and whether the limited distribution of grinding groove sites on the western fall of the Sugarloaf Range (limited to only the extreme upper catchment) was real or if it reflected lack of investigation of the broader western fall of the Sugarloaf Range area on his behalf. Mr Bluff confirmed that his inspections were mainly on the eastern fall of the range and that his investigations of the western fall were limited to the very upper catchment of creeks such as Surveyors Creek, Church Creek and Bangalow Creek.

The grinding groove sites recorded by W. T. Bluff are discussed further in **Section 3.8** in relation to site distribution.

3.6.2.2 Stone Arrangements

A number of stone arrangement sites have also been recorded within the Sugarloaf Range area and in the adjacent coastal hinterland. No reports could be located in relation to a three of these sites, however, the small amount of information contained within the DECCW/AHIMS site cards is included in this section (refer to **Figure 3.4** and **Appendix D**).

#38-4-0001 Greater Sugarloaf

This stone arrangement was described as circular in nature and used for ceremonial purposes. The site is located in the Sugarloaf Range on the western fall and approximately 5.6 kilometres north of the proposed continued underground mining area. The site is not located within the SSCA.

#38-4-0138

This site was originally recorded in 1986 by Donlon and Smith. The site is recorded as having three stone arrangements in a 36 metre square area. One of the arrangements is a cairn, comprised of eight sandstone stones of five to 30 centimetres in maximum dimension. The second arrangement is a semi-circle comprised of 20 sandstone stones of ten to 60 centimetres in maximum dimension. The third arrangement is a full circle comprised of 37 sandstone stones ranging from five to 25 centimetres in maximum dimension. The site was not located within the SSCA.

The #38-4-0138 stone arrangement sites was located within the F3 Freeway road alignment and site impact mitigation measures were taken by the RTA during construction to ensure that the site was not adversely impacted.

#38-4-0453 Munibung Hill Stone Arrangement

This site was recorded by a member of the Aboriginal community in 1986 (Mr Ken McBride). Mr McBride recorded the site as a circle of stones 2 to 3 metres in diameter with each stone being 40 to 50 centimetres in diameter. Each stone was placed so as to touch one another. This site could not be relocated by Umwelt in 2003 during background research for the LMCC ACHMP (Umwelt 2009a) and it was thought likely that it was destroyed during the installation of communication towers in the area. The site was not located within the SSCA.

Two other stone arrangement sites (containing three semi-circular stone arrangements) have been recorded in the north-eastern Sugarloaf Range area. These were located during an archaeological survey and are described in detail **Section 3.7.5**.

3.6.2.3 Scarred Trees

There are three scarred trees located between three and five kilometres east of the proposed continued underground mining area and the SSCA. Two of these trees are isolated from other site types, while one is located in proximity to registered artefact scatters and a registered PAD. No further details could be located in relation to these scarred trees.

3.7 Previous Aboriginal Archaeological Assessments

Numerous Aboriginal archaeological assessments have been conducted within or in proximity to the proposed continued underground mining area. Relevant previous Aboriginal archaeological survey and assessments are summarised below in chronological order.

3.7.1 National Highway (F3 Freeway) - Lough 1981, Donlan and Brayshaw 1986

Lough (1981) surveyed the then proposed National Highway (F3 Freeway) from Wakefield to Minmi Road and located fifteen Aboriginal archaeological sites. These included three sets of grinding grooves located on Flaggy Creek (#38-4-0091, #38-4-0092, #38-4-0093), and three

artefact scatters on Burkes Creek (#38-4-0094, #38-4-0095, #38-4-0096), 6 kilometres east-north-east of the proposed continued underground mining area (refer to **Figure 3.4**). As a result of Lough's study, the route of the National Highway was realigned to avoid impact to the sites. Donlan and Brayshaw (1986) undertook a survey of the altered route, and recorded an open campsite (#38-4-0137, 6.2 kilometres north-east of the proposed continued underground mining area. All of these sites recorded during the two studies appear to occur on or adjacent to creeklines.

3.7.2 Transgrid - Bowdler and Gollan and Bowdler and Happ 1982

Bowdler and Gollan (1982) surveyed a proposed transmission line route between Tomago and Eraring. One set of grinding grooves was recorded in the upper reaches of Cockle Creek (38-4-0118) on the eastern fall of the Sugarloaf range, 1.2 kilometres east of the proposed continued underground mining area and within the WWC ML (refer to **Figure 3.4**). The site was recorded as containing five grooves on a boulder in the creekline. The site was not to be impacted by the construction of the transmission line. However, the site was later impacted by mine subsidence.

Bowdler and Happ (1982) recorded a set of grinding grooves (#38-4-0109) on Burnt Creek on the north-eastern fall of the Sugarloaf Range, seven kilometres north of the proposed continued underground mining area. This site was recorded during a survey for a proposed transmission line route between West Wallsend and Tomago.

3.7.3 Cameron Park - Steele 1993 and Mills 1999

Steele (1993) and Mills (1999) undertook Aboriginal heritage studies of a proposed residential development at Cameron Park, approximately 8.5 kilometres north-east of the proposed continued underground mining area. Three artefact scatters (#38-5-0182, #38-5-0187, #38-5-0188), eight isolated finds (including #38-5-0180, #38-5-0181, #38-5-0183, #38-5-0184, #38-5-0186, #38-5-0189), and six potential archaeological deposits were located during the two surveys (refer to **Figure 3.4**). All of the sites were associated with Cocked Hat Creek, its terraces, and tributaries. The sites contained very low numbers (the open sites contained a maximum of four artefacts) of flakes and flaked pieces composed of silcrete and mudstone/chert, and were assessed as having low archaeological significance (n.b. ATOAC—request it is noted that this is an area that has high Aboriginal significance). The potential archaeological deposits were also associated with Cocked Hat Creek and were considered to have potentially high archaeological significance because the creekline contained landform units (creek beds with sandstone outcrops, creek terraces) which are known to contain archaeological evidence. It was not possible to examine these areas at the time of survey due to dense vegetation.

3.7.4 Newstan Colliery - Umwelt 1998 and 2004d

Umwelt (1998) undertook the archaeological survey and assessment of the Newstan Colliery Life Extension Area in consultation with KLALC. The Newstan Colliery Life Extension Area at its north-western extent abuts the southern extent of the proposed continued underground mining area (refer to **Figures 1.2 and 3.4**). Umwelt assessed that a large percentage of the Life Extension Area had been disturbed by prior mining activities.

The Umwelt survey located three isolated finds; two on creeklines and one on a spur crest. Nine rockshelters were also recorded within the Narrabeen Sandstone geology in the south-east of the Life Extension Area. Three (LEA1, 3 and 4) of the rockshelters contained either shell or stone artefacts and six (LEA2, 5 through 9) contained PAD. A set of grinding grooves (LEA10) containing three sets of two grooves measuring from 15 to 20 centimetres

in length and 5 to 7 centimetres in width; were also recorded at the head of a minor tributary. Only two of the grooves were recorded as 'well defined' (refer to **Figure 3.4**).

The rockshelters and grinding grooves were located approximately 5.5 kilometres south of the southern boundary of the proposed continued underground mining area and outside the Sugarloaf Range area and the SSCA.

Surface collection was recommended for the isolated find sites and it was proposed that any of the rockshelter sites to be impacted by subsidence be subsurface tested to evaluate their significance prior to undermining and that a monitoring program be implemented to gain a greater understanding of undermining on those rockshelter sites for which undermining was subsequently assessed as appropriate. No recommendations were proposed for the grinding groove site. Undermining of the rockshelters and grinding grooves was not proposed for 5 to 10 years after mining commenced.

Umwelt (2004d) undertook a survey of proposed Longwalls 23 and 24 within the Life Extension Area in 2004 in consultation with KLALC. No sites were located and there were no constraints to undermining.

The Newstan Colliery Life Extension Area underground mine is currently under 'care and maintenance'. Prior to ceasing underground mining, the rockshelter sites were not subsurface investigated or impacted and the grinding groove sites were not impacted, thus no further information is available about their contents, significance or the outcomes of subsidence.

3.7.5 Hunter Expressway - Brayshaw 1994, 2001, Umwelt 2003a, 2003b, 2006e, 2006f, 2010

This series of related projects will be discussed in some detail as they are the only projects undertaken within the Sugarloaf Range area that incorporate information in relation to a broad range of site types and report on both surface survey and subsurface salvage. It is noted that this project area is located within the Tasman Mine Lease area (refer to **Figures 1.2** and **3.4**).

Detailed archaeological surface and subsurface investigations have been undertaken along a narrow (150 metres wide and 40 kilometres long) east-west corridor from the F3 Interchange near Seahampton to Branxton) for the Hunter Expressway project (formerly the F3 to Branxton Highway Link). For this discussion only the eastern four kilometre section of the road corridor, where it crosses the Sugarloaf Range (seven kilometres north-east of the proposed continued underground mining area) is relevant to the present discussion. As noted in **Section 3.1.2**, during this investigative process ALALC, MLALC, BCAC, BNC and LWTC were requested to provide their own reports on the values and significance of the landscape crossed by the road corridor. As demonstrated by the comments provided by the participating Aboriginal organisations in **Section 3.0 Part A** the Sugarloaf Range has high Aboriginal cultural values and significance for not only the traditional owners of the land, the Awabakal, but also for neighbouring inland groups.

In relation to the location of Aboriginal archaeological sites, the initial assessment of the proposed road corridor was undertaken in 1994 by Brayshaw MacDonald for Connell Wagner. The 1994 survey was undertaken in consultation with MLALC. The initial survey located only one isolated find near Minmi Creek and one PAD (in a rockshelter) near Burnt Creek, a tributary of Blue Gum Creek within the north-eastern extent of the Sugarloaf Range area (refer **Figure 3.4**). While reported by Brayshaw (1994), these sites do not appear on the DECCW/AHIMS site register. In 2001, at the request of DECCW, Brayshaw (2001) resurveyed parts of the area, this time with both ALALC and MLALC. The 2001 survey did not result in further site locations.

Prior to the Brayshaw (1994, 2001) surveys, five sites were known in the area. All five were sets of grinding grooves. All of the grinding groove sites were located on sandstone benches outcropping in Blue Gum Creek (Blue Gum Creek Grinding Grooves #38-4-0235 and #38-4-0236), Minmi Creek (Seahampton 1 #38-4-0394, Seahampton 2 #38-4-0393) and a tributary of Minmi Creek (Seahampton 3 #38-4-0392) (refer to **Figure 3.4**) and all on the north-eastern fall of the Sugarloaf Range. Three of these sites were within 100 metres of the proposed road corridor; one was on an access track required by RTA for geotechnical testing and one was within 100 metres of the F3 Freeway/Newcastle Link Road Interchange (refer to **Figure 3.4**).

In November 2003, Umwelt (2003b) was commissioned to undertake the inspection of the road corridor and associated areas of impact as part of Task 3 of the Additional Aboriginal Heritage Assessment required by DECCW for the project. This third inspection of the route alignment was at the request of ALALC, BCAC, BNC, LWTC and MLALC. The inspection was to focus on obtaining information related to the distribution of Aboriginal resources (e.g. water, food and medicinal plants, stone for tool manufacture, shelter, areas with expansive outlooks, areas suitable for camping etc) in the landscape and how this related to site distribution. The inspection was also to be used as an opportunity to collect data to formulate the detailed Research Design and Methodology required for the salvage of sites and subsurface testing of areas to be impacted by the project.

The four kilometre section of the route to be inspected within the Sugarloaf Range by Umwelt and the ALALC (only ALALC was involved as the area was within Awabakal land and within the boundary of the ALALC) had been modified from that surveyed by Brayshaw in 1994 and 2001. The modifications acted to protect the known grinding groove sites within proximity to the road corridor by ensuring that the road corridor was downstream of the sites (thus ensuring no indirect impacts through addition of water/sediment to the bedload of the creeks) and at a distance where inadvertent impact during construction could be avoided. The modifications also removed any possibility of impact to the rockshelter with PAD and isolated find recorded by Brayshaw (1994, 2001).

Throughout the period December 2003 to February 2004 inspections of the modified road corridor within the Sugarloaf Range were undertaken with representatives of ALALC. The inspections found that the Sugarloaf Range area had a good resource base of seasonal plant foods and a large number of medicinal plants that were not available along the coast, in the coastal hinterland and further inland. The Sugarloaf Range also had many sandstone outcrops associated with creeklines that were suitable for grinding stone implements and cliffines and fallen boulders suitable for rockshelter formation (Umwelt 2003a, 2003b – refer also to **Section 3.0 Part A** for comments from ALALC).

The inspections located seven previously unrecorded sites and two areas of high Aboriginal cultural heritage sensitivity (Umwelt 2003a). The two areas of high cultural sensitivity included an Aboriginal pathway that follows the present route of the Sugarloaf Range Road and Stockrington Road from Mt Sugarloaf to Pambalong and Hexham Swamps to the north and north-east. This pathway was intersected by the proposed Hunter Expressway road corridor. The second area was adjacent to Blue Gum Creek. This area had a large rockshelter (no floor deposit), a waterfall and plunge pool and an artefact scatter and PAD (Blue Gum Creek 4 Artefact Scatter and associated PAD #38-4-0763).

The remaining sites located within the Sugarloaf Range consisted of one isolated find (Blue Gum Creek 3 Isolated Find #38-4-0762), three artefact scatters (Sugarloaf 1 Artefact Scatter and associated PAD #38-4-0759; Blue Gum Creek 1 Artefact Scatter #38-4-0760; Blue Gum Creek 2 Artefact Scatter #38-4-0761); one set of grinding grooves (Blue Gum Creek 5 Grinding Grooves #38-4-0236) and two stone arrangement sites (incorporating three stone

arrangements - Minmi Creek Stone Arrangement 1 #38-4-0819 and Minmi Creek Stone Arrangements 2 and 3 #38-4-0820).

The stone arrangements were described as follows:

Minmi Creek Stone Arrangement 1 #38-4-0819 – A circular arrangement of sandstone boulders. Located 5 metres east of Minmi Creek at the lower slope/creek terrace interface. The stone arrangement measured 5 metres (N-S) by 4.5 metres (E-W). There was an 80 centimetres wide opening on western side. The stone arrangement was 1.4 metres high at its highest point.

Minmi Creek Stone Arrangements 2 and 3 #38-4-0820 - Two additional stone arrangements located approximately 30 metres downstream of Minmi Creek Stone Arrangement 1 #38-4-0819. The stone arrangements were similar in shape and size to Minmi Creek Stone Arrangement 1, however, they were overgrown by vegetation and some walls had been damaged by tree growth.

Details of the grinding groove sites are provided in **Appendix D**.

All of the sites located were within the proposed 150 metres wide road corridor or on an access track required during geotechnical testing with the exception of the Blue Gum Creek 5 Grinding Grooves which were 50 metres north of the road corridor but within an access track proposed for use during construction. Due to the high Aboriginal cultural and archaeological significance of the:

- Minmi Creek Stone Arrangements (#38-4-0819 and #38-4-0820) - RTA modified its construction plans to incorporate a bridge to span the sites and they will be protected within a temporary conservation zone that will be fenced prior to the commencement of construction in the area; and
- Blue Gum Creek Grinding Groove 5 site (#38-4-0236) - RTA also modified its plans and a different access route will be used and the site will be permanently fenced prior to construction so that it will not be inadvertently impacted during construction and so that vehicular traffic will be diverted around the site in future.

In relation to the five sets of grinding grooves previously known within proximity of the road corridor, RTA has incorporated various management options to ensure their conservation including:

- the movement further east of the proposed off ramp for the Hunter Expressway from the F3 to increase the distance between the off ramp and the Seahampton 1 Grinding Groove Site (#38-4-0394);
- the temporary demarcation of the Seahampton 3 Grinding Groove site (#38-4-0392) so that it was not impacted by vehicular movements during the geotechnical testing phase;
- the temporary fencing of the Seahampton 2 Grinding Groove site (#38-4-0393) during the construction period to prevent inadvertent impact; and
- the temporary fencing of the Blue Gum Creek Grinding Grooves #38-4-0235 and #38-4-0236 if construction activities come within 50 metres of their boundaries.

All of the above conservation outcomes will be managed under an Aboriginal Cultural Heritage Plan of Management (ACHPOM - Umwelt 2010).

Surface collection under Section 90 Consent #1940 was undertaken for the artefact scatter and isolated find sites within the road corridor. Subsurface investigations were undertaken under Section 90 Consent #1940 at Blue Gum Creek 4 Artefact Scatter and associated PAD #38-4-0763 and Sugarloaf 1 Artefact Scatter and associated PAD #38-4-0759).

Table 3.4 provides details of the contents of the isolated find and artefact scatter sites

Table 3.4 - Sites in Sugarloaf Range Salvaged under Section 90 Consent #1940

Site Name	DECCW Site #	No. of Artefacts
Sugarloaf 1 Artefact Scatter and associated PAD	#38-4-0759	23 surface and 3 subsurface
Blue Gum Creek 1	#38-4-0760	2 surface
Blue Gum Creek 2	#38-4-0761	32 surface
Blue Gum Creek 3 IF	#38-4-0762	1 surface
Blue Gum Creek 4 Artefact Scatter and Associated PAD	#38-4-0763	8 surface and 2 subsurface

The Sugarloaf 1 Artefact Scatter and associated PAD (#38-4-0759) contained a total of 23 surface artefacts which were collected from an area at the intersection of two tracks on a low ridge crest between a tributary of Minmi Creek and the main channel of Minmi Creek. The artefacts were spread along the tracks over an area approximately 100 metres in length by 5 to 8 metres in width. The artefacts consisted of flakes, broken flakes, flaked pieces and a single core. The majority of the artefacts were manufactured from Nobbys tuff. There was one silcrete core and one silcrete flaked piece (probably broken off the core by impact with the dozer during road construction). **The artefacts had been badly damaged from road construction, vehicular traffic and bushfire.** (n.b. 'ATOAC 1 April 2010 - requests this comment be highlighted, given that this is further evidence of cumulative impacts and destruction of Cultural Heritage values.)

Four 1 x 1 metre squares were excavated in areas off the road on the crest of the low ridge. The areas chosen for excavation were those deemed to be the least disturbed by prior tree clearance and road construction and were located within close proximity of the surface artefacts. The soil consisted of remnant A2 horizon, less than 15 centimetres in depth. Square 1 contained three Nobbys tuff broken flakes, two in Spit 1 and one in Spit 3. Square 3 contained one silcrete broken flake in Spit 2.

Blue Gum Creek 4 Artefact Scatter and Associated PAD (#38-4-0763) contained a total of eight surface artefacts which were collected from **an eroded foot/motor bike track** (n.b. ATOAC 1 April 2010 – request that this is highlighted as this is an indication of unmanaged Cultural Heritage disturbance) and from the surface of a conglomerate rock exposure on the south-eastern side of Blue Gum Creek. Artefact types included flakes and broken flakes manufactured from Nobbys tuff, basalt and quartz. The majority of the artefacts exhibited evidence of being exposed to uncontrolled heat from bushfire (burnt, crazed, shattered).

Four 1 x 1 metre squares were excavated on a heavily grassed, level bench, on the slope on the eastern side of the track. At the time of site recording it was proposed that this area had the potential to have retained some topsoil (which had been eroded from the remainder of the slope); however, the excavations found that the majority of the topsoil was also missing from this area with only an extremely gravelly, A2 horizon of 5 to 15 centimetres in depth over the clay.

One broken basalt flake was located in Spit 1 of Square 2 and one broken silcrete flake was located in Spit 1 of Square 4.

In both excavations substantial soil loss and subsurface disturbance was noted. This appeared to have been caused by logging activities (related to obtaining pit props) which had disturbed the topsoil and acted to destabilise the slopes (ATOAC 1 April 2010 – request that this be seen as an example of cumulative disturbance of the region). Only very low numbers of subsurface artefacts were located. This result reflected the surface scatters which also contained relatively low numbers of artefacts.

The surface artefacts collected from the remaining sites were flakes, broken flakes and flaked pieces manufactured predominantly from Nobbys tuff and with minor numbers of basalt and silcrete. The majority of the artefacts collected from Blue Gum Creek 2 (#38-4-0761) were very small portions of broken flakes and heat shattered flakes manufactured from Nobbys tuff. It is assessed that the 32 fragmentary artefacts in this site reflect, what was a much smaller assemblage, at the time of discard. The artefacts had been damaged and broken due to track construction/use in the area (most probably related to the construction of a tunnel for the Richmond Vale Railway which was adjacent to the site) and bushfire (heat shatter).

In summary, RTA consulted with Aboriginal stakeholder groups to ascertain the significance of the Sugarloaf Range area and following comments and advice from the registered Aboriginal stakeholders modified its plans to avoid impact to known grinding groove sites. RTA undertook a third investigation of the modified road corridor through the Sugarloaf Range area. Based on the results of this investigation (which located one isolated find, five artefacts scatters, two stone arrangement sites and an additional set of grinding grooves) and comments and advice from the registered Aboriginal stakeholders, RTA further modified the plans for the Hunter Expressway road corridor through the Sugarloaf Range in order to prevent impact to the two stone arrangement sites and additional grinding groove site. RTA also surface collected and/or subsurface salvaged the isolated find and artefact scatters that were within the road corridor or on access tracks required during geotechnical testing or road construction.

The sites remaining in association with the Hunter Expressway road corridor will be managed in compliance with an ACHPOM (Umwelt 2010) during the construction and maintenance phases of the project.

3.7.6 Tasman Underground Mine (Umwelt 2002)

Umwelt was commissioned to undertake an archaeological assessment of an eight hectare area to be impacted by surface infrastructure associated with the (then) proposed Tasman underground mine. The eight hectare surface infrastructure area, located within the larger project/mine lease boundary of approximately 60 hectares, is immediately west of George Booth Drive, approximately 1.5 kilometres west of the town of Seahampton and 2 kilometres east of Mount Sugarloaf (Umwelt 2002: 2). The southern boundary of the broader Tasman ML is approximately 2.4 kilometres north of the northern boundary of the proposed continued underground mining are (refer to **Figure 1.2**).

A search of the DECCW AHIMS register (in 2002 the NPWS register) undertaken for the project covering Mount Sugarloaf and the major creeklines in proximity to the Sugarloaf Range returned 60 sites including 12 artefact scatters, 15 isolated finds, two stone arrangements and 31 sets of grinding grooves. It was noted at the time that it was unusual for there to be so many grinding groove sites in one small area when the remainder of the central lowlands of the Hunter Valley had only 19 grinding groove sites registered in total.

One day of pedestrian field survey was conducted in the area in April 2001 by Katie Sachs (Archaeologist, Umwelt) and Allan Eastwood (representing ALALC). The survey concentrated on vehicle tracks, transmission lines and other areas of enhanced ground

surface visibility. The survey covered approximately 5% of the 60 hectare project/mine lease boundary. The focus of the survey effort was located on/near areas to be impacted by surface infrastructure as the underground mining was to be undertaken by the bord and pillar method which has no impact to the ground surface as it does not result in subsidence. The decision to use the bord and pillar methodology of longwall mining was based on the limited coal resource in the area.

No archaeological sites were located during the survey of the surface infrastructure area. It was recommended that no further archaeological works were required (Umwelt 2002: 13).

Of the 31 sets of grinding grooves known to have been located in the Sugarloaf Range in 2002, 24 sets were located within the Tasman Mine Lease (14 sets of these were recorded by Bluff - refer to **Figures 1.2** and **3.4**). As underground mining in the Tasman ML is being undertaken using the bord and pillar method which does not result in subsidence, these grinding groove sites have not been impacted by mine development and Tasman Mine does not have approval for the damage/destruction of these site by undermining (Umwelt 2002).

3.7.7 Further Archaeological Assessment for West Wallsend Colliery (Umwelt 2005)

This report to Oceanic Coal summarised the findings of a 2004 assessment of the 'Northern Domain', part of WWC underground mining operations located adjacent to, but outside of the proposed underground mining area. The Northern Domain longwall layout proposed in 2005 was comprised of six longwalls, oriented north-east/south-west starting from the north-eastern tip of the proposed continued underground mining area and extending south, terminating approximately 200 metres north of previously recorded grinding groove site AHIMS #38-4-0118 (refer to **Figure 3.4**).

The report also assessed the archaeological constraints associated with a new longwall mining operation south of the F3 Freeway known as the 'Southern Domain'. The Southern Domain is located inside the proposed continued underground mining area south of the F3 Freeway and was proposed in 2005 as five longwalls, four oriented in alignment with the F3 Freeway (north-east/south-west) and the fifth longwall to be oriented in a north-west/south-east alignment running almost at right angles along the north-eastern extent of the other four longwalls (refer to **Figure 3.5**).

Consultation was undertaken with the ALALC and KLALC for areas within their respective boundaries. A Sites Officer from each organisation was present during field surveys and inspections inside their respective Land Council boundary.

The original assessment of the Northern Domain was undertaken in September 2004 (Umwelt 2004a). The original survey was targeted towards assessing if there were grinding groove sites along creeklines or rockshelter sites along cliffines, or under fallen boulders, as it was assessed that these sandstone based site types were likely to suffer greatest detrimental impact from underground mining. No sites were located during the 2004 assessment and only one previously known artefact scatter site occurred within the Northern Domain. At the behest of ALALC a subsequent unsuccessful attempt was also undertaken in May 2005 to locate previously recorded AHIMS site #38-4-0776 (an artefact scatter of two stone artefacts – a mudstone core and a quartzite flake). It was concluded that no archaeological constraints were associated with underground mining in the Northern Domain (Umwelt 2005:1).

Field survey of the Southern Domain area was undertaken in May 2005. In this assessment area the creeklines were the focus of the survey as these were assessed as the most likely location for grinding groove sites (due to the differences in topography rockshelters were not assessed as likely in this area). One grinding groove site (Palmer's Creek 1 - #38-4-1007)

was recorded. It was recommended that further consultation be undertaken with KLALC following a specific subsidence assessment of the site to determine appropriate management.

Undermining of Palmers Creek 1 (#38-4-1007) did not go ahead and the site is currently located at the southern extent of the proposed continued underground mining area (refer to **Section 5.3.2.10** and **Figure 3.5**).

3.7.8 Western Domain within the Proposed Continued Underground Mining Area (Umwelt 2006a)

Umwelt was commissioned to conduct an archaeological assessment of five longwalls known as the 'Western Domain', located inside and roughly corresponding with the five eastern most longwalls proposed in the proposed continued underground mining area (refer to **Figure 3.5**). Prior to the assessment only one site (an isolated find comprised of '1 flake found in the roadway' (Lough and Associates 1981:4 Appendix 1)) was known to occur in the project area (Umwelt 2005:8).

The strategy for the field survey of the Western Domain conducted in April 2006 was to target creeklines, ridges, spurs and locations which afforded good ground surface visibility. Due to generally dense vegetation and leaf litter away from the creeklines, roads, animal and motorcycle tracks within the project area were targeted for survey as they provided better ground surface visibility and covered topographic locations such as ridges and spurs, which are known to have been used by Aboriginal people to negotiate the steeper areas of the sandstone country (Vinnicombe 1980, ALALC 2003) and which commonly have small artefact scatter sites resulting from this transient use. Creeklines were targeted for survey as one of the objectives of the survey was to locate any axe grinding grooves that may be present as these (sandstone) sites were considered to have the highest potential to be adversely impacted by subsidence following underground mining. Watercourses were targeted because it was observed that artefact scatter and isolated find sites have generally been located on lower slopes/footslopes adjacent to creeks. Creeklines were also assessed as likely to be impacted by mine subsidence through the need for remediation works to correct ponding (Umwelt 2006b:9).

Nine previously unrecorded sites were located during the Western Domain survey, five artefact scatters and four isolated finds. The raw materials used for implement manufacture included tuff, silcrete and basalt. All but one of the sites recorded was located in a disturbed context within an existing vehicle track, a vehicle track which had been previously graded, or in an area where vegetation had been mechanically cleared (Umwelt 2006b:10). The exception to this highly disturbed context was site Western Domain 5 (#38-4-0993 – refer to **Appendix E**) a small artefact scatter located on a sandstone rubble bank immediately adjacent to a small perched wetland which became known as the 'wet soak' (Umwelt 2007, Umwelt 2008:1).

In addition to the sites recorded during the survey, attempts were made to locate two previously recorded artefact scatter sites, one inside the Western Domain area, one just outside (#38-4-0097 and #38-4-0098). Attempts to find these sites were unsuccessful, in large part due to the dense vegetation cover present at each of the previously recorded site locations (Umwelt 2006b:12) (refer to **Figure 3.5**).

The majority of the nine sites recorded during the Western Domain survey were assessed as being typical of the artefact scatter and isolated find sites located throughout the Sugarloaf Range and the Lower Hunter Valley. Two sites recorded during the survey however were assessed as being unusual or unique within the previously recorded sites of the area. Western Domain 5 (#38-4-0993 – refer to **Appendix E**) was located in a unique landscape context, while Western Domain 8 (#38-4-1002) had a relatively large number of artefacts in

its assemblage compared to other sites in the locality and also contained an implement type (a backed point or Bondi Point) rarely recorded in the Sugarloaf Range (Umwelt 2006b:12).

Where possible it was recommended that sites be conserved *in situ* as the nature of the sites, being comprised solely of stone artefacts meant that impacts due to subsidence alone were likely to be negligible (sites Western Domain 6, Western Domain 7 and Western Domain 8). *In situ* conservation was not achievable in relation to sites Western Domain 1, Western Domain 2, Western Domain 3, Western Domain 4 and Western Domain 9, however, due to the potential failure of a dam wall and subsequent damage caused by the resultant high water flow. It was recommended that the artefacts from these sites be temporarily collected prior to subsidence and returned to the site area as close as practicable to their original recorded locations after underground mining and requisite remediation works were completed (Umwelt 2006a:27).

As the environmental context of Western Domain 5 (#38-4-0993) was assessed as rare/possibly unique and not well understood it was recommended that a geomorphic investigation in the form of auger testing be undertaken to determine the nature of the wet soak. It was assessed that only after obtaining further geomorphic information could the nature of the wet soak feature and the potential for subsidence to impact this feature be known and an appropriate management/mitigation outcome for the site considered (Umwelt 2006b: 27-28) (refer to **Section 3.7.12** for the outcomes of the geomorphic testing).

3.7.9 Northern Domain (Umwelt 2006b)

Following previous assessments the long wall layout of the Northern Domain was redesigned prior to approval being sought. The two western-most longwalls were extended by approximately 125 metres and 75 metres respectively. The extension of the western-most longwall (LW37) meant that previously recorded artefact scatter AHIMS #38-4-0766 (refer to **Figure 3.5**) was located within the subsidence impact area. Because the effect of subsidence was determined to be negligible to the artefact scatter it was assessed that there was no archaeological constraint to the Northern Domain project. It was further recommended that any mitigation works which may be conducted (such as those to correct creek ponding) be undertaken in consultation with the ALALC (Umwelt 2006b:10).

3.7.10 Proposed Easement, Tasman Lease, West Wallsend (Umwelt 2006c)

Umwelt was commissioned by Newcastle Coal to prepare an assessment for a proposed power easement running from the township of West Wallsend north-west and terminating approximately 2 kilometres east of Mt Sugarloaf near the township of Seahampton (Umwelt 2006c: 1.1). Due to the linear nature of the power easement and the localised nature of the impact from pole emplacement the entire project area was inspected via a pedestrian survey (Umwelt 2006c: 5.1-5.2).

One artefact scatter comprised of two silcrete flakes and one tuff flake was recorded during the survey. Though the artefacts themselves were located adjacent to the easement and wholly outside the project area the landform in which the artefacts were found (ephemeral drainage line) was present in the proposed easement and the site area was defined as extending into the project area based on its landform context. This site was assessed as having a low archaeological and cultural significance due to its highly disturbed nature (Umwelt 2006c:5.2).

The artefact scatter site was thought to be typical of those known in the area as it was associated with a creekline, had a small number of artefacts manufactured from raw materials common to sites in the area.

The assessment concluded that no further archaeological or cultural heritage management works were required in relation to the project, providing that no ground disturbance (either from vegetation clearance or pole emplacement) impacted the site area (Umwelt 2006c: 7.2).

3.7.11 Southern Domain within the Proposed Continued Underground Mining Area (Umwelt 2006d)

Following the results of previous investigations the longwall layout of the Southern Domain was redesigned prior to approval being sought. This assessment report presented the results of the previous archaeological assessment and subsequent consultation with the KLALC in relation to grinding groove site Palmers Creek 1 (#38-4-1007). The five longwalls were reoriented north-west/south-east and the length of one of the longwalls was shortened so as to avoid any impact to Palmers Creek 1.

3.7.12 Geomorphic Investigation of the 'Wet Soak' Associated with Artefacts Scatter WD5, within the Proposed Continued Underground Mining Area (Umwelt 2008)

In accordance with Aboriginal Heritage Impact Permit (AHIP) #2789 a geomorphic investigation was conducted in May 2008 in relation to the perched wetland known as the 'wet soak' on whose banks artefact scatter Western Domain 5 (#38-4-0993 – refer to **Figure 3.5**) is located. The purpose of this investigation was to confirm whether the wet soak was a natural rather than anthropogenic feature and to determine the origin and persistence of the perched wetland (Umwelt 2008:1).

Five, 10 centimetre diameter auger holes were excavated to depths of between 35 centimetres and 70 centimetres at the edges and downstream of the wet soak. On-site analyses of sediment texture and fabric, colour and mottling, pH and field texture were conducted (Umwelt 2008:3). Results of the geomorphic testing showed that a sandy clay, intersected by four of the five auger holes, is the *in situ* material which seals the floor of the wet soak. This clay is distinct from the surrounding skeletal earthy fabric, sand textured soils (Umwelt 2008:5). It was therefore concluded that the wet soak is an entirely natural feature which persists because of the presence of minor claystone units in the locale geological strata (Umwelt 2008:6).

The Western Domain 5 site (#38-4-0993) was assessed as highly significant to the ADTOAC and the ATOAC and the Western Domain mine plan was modified to avoid impact to this site.

3.7.13 Western Domain Salvage, within the Proposed Continued Underground Mining Area (Umwelt in prep.)

In accordance with the recommendation of the Western Domain Archaeological Assessment (Umwelt 2006b) an AHIP under Section 87 of the *National Parks and Wildlife Act 1974* was sought from and granted by the DECCW (7 April 2009) for the temporary surface collection of two isolated finds and three artefact scatters located downstream of the dam on the McCarthy property within the proposed continued underground mining area (sites are shown as #38-4-0996, #38-4-0997, #38-4-098, #38-4-0999 and #38-4-1003 on **Figure 3.5**). The surface collection under Section 87 AHIP #1098480 was carried out on Tuesday 23 June 2009. A total of 30 artefacts were collected from the site locations previously recorded in April 2006. In accordance with the conditions of the AHIP the artefacts will be returned following underground mining, subsidence and any requisite subsidence remediation works. At this time revised site cards will be proved to the DECCW.

**Table 3.5 - Summary of Artefacts Recorded Western Domain Survey
April 2006 and Artefacts Collected June 2009**

Site	# of Artefacts (WD Survey)	Artefact Description(s)	# Artefact Collected (LW 38 Salvage)	Artefact Description(s)
Western Domain 1 (#38-4-0996)	1	tuff core	1	silcrete flake
Western Domain 2 (#38-4-0997)	10	7 tuff flakes (some heat shatter), 1 volcanic flake with residues, 1 silcrete flake, 1 silcrete core	6	4 silcrete broken flakes, silcrete flake, silcrete core
Western Domain 3 (#38-4-0998)	5	3 tuff flakes, 1 petrified wood flake, 1 silcrete flake	7	2 silcrete broken flake, tuff flake, 3 tuff broken flakes and a tuff broken retouched flake
Western Domain 4 (#38-4-0999)	6	5 silcrete flakes and broken flakes, 1 tuff broken flake	12	2 silcrete broken flakes, 1 silcrete flake, 2 tuff flakes, a tuff core, 6 tuff broken flakes
Western Domain 9 (#38-4-1003)	1	heat effected silcrete broken flake	4	3 tuff broken flakes and a silcrete flake
Total # Artefacts Recorded 2006	23	total # artefacts collected 2009	30	

The differences in the artefacts recorded in 2006 and those collected in 2009 demonstrate the highly mobile and erodible nature of the skeletal sandy soils within the proposed continued underground mining area. Taphonomic processes such as erosion and mass movement from extreme weather events such as the June 2007 storm (refer to **Section 3.0 Part B**) mean that the sites recorded with the proposed continued underground mining area, especially sites containing stone artefacts and especially those found in disturbed contexts such as earthworks and vehicle tracks, are subject to ongoing impact (movement, burial, reburial, exposure).

3.7.14 Conservation Status of Sites

The DECCW/AHIMS register indicates that there are 119 sites located within the SSCA (refer to **Figure 3.4**). From **Figure 1.2** it can be seen that mine leases cover a large proportion of the SSCA and the Sugarloaf Range and its general environs. The breakdown of registered sites within mine leases is as follows (refer to **Figure 3.4**):

- Tasman Mine Lease contains 23 grinding groove sites, one stone arrangement, one PAD and four artefact scatters;
- WWC CCL 725 contains seven grinding groove sites (one has been destroyed), one stone arrangement, three scarred trees, one PAD and 27 artefact scatters;
- WWC CCL 718 has five grinding groove sites and four artefact scatters;

- WWC ML 1451 has six grinding groove sites, and one grinding groove with possible art; and
- Newstan ML has nine rockshelters with artefacts and/or PAD, one rockshelter with axe grinding grooves, two grinding groove sites, one grinding groove site/waterhole/well, seven artefact scatters and 15 shell midden sites.

Tasman Mine is using bord and pillar extraction and thus is not causing subsidence and not impacting upon surface sites; so all sites within its mine lease are extant. Tasman would be required to modify its approval to impact any of the sites in its mine lease. Newstan Colliery has suspended operations and is currently under care and maintenance and has at this stage not undermined any of its rockshelter or grinding groove sites which also remain extant. If Newstan do recommence operations it will be required to obtain Section 90 consent from DECCW in order to impact any of the sites in its mine lease. A small section of the southern extent of ML 1451 is within the proposed continued underground mining area boundary and is subject of the current assessment. WWC would be required to undertake further assessment if in the future it had plans to mine the remainder of the ML.

One of the grinding groove sites (Cockle Creek Grinding Grooves #38-4-0118 in CCL725) within the SSCA is known to have been damaged by mine related subsidence (for site locations refer to **Figure 3.4**). Based on the DECCW/AHIMS data the remainder of the sites are extant.

Of the 120 sites listed above, 37 sites are within the SSCA including:

- 15 grinding grooves in the Tasman Mine Lease;
- five grinding groove sites and four artefact scatters in CCL718;
- six grinding groove sites and one grinding groove with possible art in ML 1451; and
- one grinding groove site/waterhole/well in the Newstan Mine Lease.

All 35 known sites in the SSCA and in mine leases are still extant. The 35 sites within the SSCA and within mine leases will be managed in accordance with the POM for the SSCA when it is completed in 2013. According to the DECCW AHIMS a further five sites¹² (all grinding grooves) occur in the SSCA that are outside mine leases which will also be managed under the POM for the SSCA.

None of the sites located outside the SSCA are in formalised conservation areas. In recognition of the high Aboriginal cultural and archaeological significance of the eight grinding groove and three stone arrangement sites located within the road corridor or within proximity to the road corridor of the existing F3 and the proposed Hunter Expressway; these sites were protected during construction (F3) or will be protected during construction (Hunter Expressway) in temporary conservation zones.

Thus, though there are many sites and site types within the Sugarloaf Range only those within the SSCA are presently targeted for conservation. However, even within the SSCA undermining is not precluded within existing mine leases and long-term conservation is not guaranteed, but site impact must be assessed in regard to the cultural value of the sites/area.

¹² An additional grinding groove site was added to this number following the survey – refer to **Section 5**.

3.8 Summary of Previous Aboriginal Archaeological Investigations

Ten of the 13 Aboriginal archaeological sites recorded during previous assessment conducted within the proposed continued underground mining area are comprised of artefact scatter and isolated find sites. These sites are generally located in highly disturbed contexts such as on unformed vehicle tracks, graded unsealed roads and areas mechanically cleared of vegetation, where ground surface visibility is favourable. Artefact scatters recorded during previous archaeological assessments are also known to occur in association with watercourses and persistent water features (such as the wet soak).

Three grinding groove sites have also been registered within the proposed continued underground mining area (one of these sites (#38-4-0462) has subsequently been found to have been recorded incorrectly and is outside the proposed continued underground mining area). The grinding groove sites were associated with sandstone platforms in the Bangalow Creek and Palmers Creek catchments.

The nature of the sandy skeletal soils within the proposed continued underground mining area and surrounds mean that sites containing stone artefacts and grinding groove sites are likely to be effected by ongoing and active taphonomic processes such as erosion and mass movement of sediment that acts at times to expose or bury sites. Movement of sediment laden water across the grinding grooves also acts to wear them away by abrasion.

No other site types were known within the proposed continued underground mining area.

In the broader Sugarloaf Range area and within the SSCA grinding groove sites are the dominant site type listed on the DECCW/AHIMS. Grinding of axes, adzes and hatchets was indicated by the dimensions of the grooves previously recorded in any detail.

The location of the grinding groove sites by catchment is discussed in **Table 3.6**. In total 52 grinding groove sites are registered within the Sugarloaf Range and 34 of these are within the SSCA and under the management of the NPWS/DECCW. The grinding groove sites are predominantly located on the eastern fall of the Sugarloaf Range (28 sites) and within the very upper catchment of creeklines on the western fall of the Sugarloaf Range (24 sites). According to the DECCW/AHIMS site register one of the grinding groove sites (Cockle Creek 1 #38-4-0118) has been impacted by mining. This result is attributed to modifications to plans for the road corridor for the F3 and for the Hunter Expressway (refer to **Sections 3.7.2** and **3.7.5**), the use of bord and pillar mining in the Tasman ML (refer to **Section 3.7.6**) and the cessation of operations within the Newstan ML prior to impact on its two grinding groove sites (refer to **Section 3.7.4**).

Table 3.6 - Location of Grinding Grooves within the Broader Sugarloaf Range

Catchment	Location on the Sugarloaf Range	Within Sugarloaf State Conservation Area	Number of Sites
Bangalow Creek	western fall	Yes	5
Church Creek	western fall	Yes	1
Church Creek	western fall	No	2
Blue Gum Creek	north-eastern fall	No	4
Blue Gum Creek	north-eastern fall	Yes	1
Brush Creek	eastern fall	No	1
Burkes Creek	eastern fall	Yes	12
Burkes Creek	eastern fall	No	1

Table 3.6 - Location of Grinding Grooves within the Broader Sugarloaf Range (cont)

Catchment	Location on the Sugarloaf Range	Within Sugarloaf State Conservation Area	Number of Sites
Cocked Hat Creek	north-eastern fall	No	1
Cockle Creek	eastern fall	No	1
Ironbark Creek	eastern fall	No	2
Minmi Creek	north-eastern fall	No	3
Palmers Creek	south-eastern fall	Yes	2
Slatey Creek	eastern fall	No	13
Slatey Creek	eastern fall	Yes	1
Stoney Creek	eastern fall	No	1
Surveyors Creek	western fall	Yes	12
Surveyors Creek	north-western fall	No	6
Winding Creek	western fall	No	1
Total		34 in	69

Three stone arrangement sites (consisting of four stone circular arrangements) are registered within the Sugarloaf Range area but none of these are within the SSCA. Two of the stone arrangement sites will be protected within a temporary conservation zone during the construction of the Hunter Expressway, however, no long term conservation is currently proposed for any of the stone arrangement sites. Two further stone arrangements are known in the broader area. One, (that appears to have been destroyed by development) was recorded on Munibung Hill at Speers Point; the other in Cameron Park area is located near the Newcastle exit of the F3 Freeway. Impact to the site was avoided during construction of the F3 Freeway. This site was comprised of three stone arrangements, a circle, a semi-circle and a cairn.

There are no scarred trees recorded within the Sugarloaf Range area, or SSCA, however, three scarred trees are registered to the north-east in the Holmesville/West Wallsend area. There are no scarred trees in conservation in the Sugarloaf Range area.

There are no DECCW registered Aboriginal archaeological rockshelter sites within the Sugarloaf Range area or within the SSCA, however, Brayshaw (1994, 2001) does report a rockshelter with PAD in Burnt Creek in the north-eastern extent of the Sugarloaf Range (outside the SSCA) and numerous rockshelters without evidence of occupation are known from the Aboriginal oral history and previous survey to occur in the area. There are currently no registered rockshelter sites in conservation in the Sugarloaf Range area.

Section 3.0 Part D

3.9 The Predictive Model

3.9.1 Implications of the Aboriginal Cultural Values, Physical and Ethnographic and Archaeological Context of the Continued Underground Mining Area

Taking into account the Aboriginal cultural values discussed in **Section 3.0 Part A**; the implications of the physical context of the continued underground mining area as presented in **Section 3.0 Part B** and ethnographic observations and previous archaeological research

presented in **Section 3.0 Part C** it can be predicted that the following archaeological evidence may be present within the continued underground mining area:

- burials may be present – if so these may be marked by crying trees and/or stone arrangements and will be of Aboriginal cultural value;
- if mature trees remain, scarred trees may be present resulting from the removal of bark/heartwood for the manufacture of wooden bowls (coolamons), shields, boomerangs, swords etc. and/or for ceremonial purposes. Scarred trees will also be of cultural value;
- the Puttikan legend (when viewed in connection with the male initiation ceremonies that are reported to have taken place on Mount Sugarloaf), may have been used to restrict access to parts of the Sugarloaf Range to initiated men and male initiates. Uninitiated men, woman and children may have been kept away from the area by the Puttikan legend. If so, the archaeological signature of a restricted area (e.g. smaller camp sites, sites related to activities usually connected to men - such as axe grinding grooves, stone arrangements and scarred trees related to male initiation ceremonies etc.) as opposed to a more secular context (e.g. large camp sites with evidence of food preparation generally thought to be specific to women such as plant food preparation) could be expected;
- the Sugarloaf Range may have been used as a place to trade with other Aboriginal groups (ATOAC – Dene Hawken and Kerrie Brauer pers. com. 9 June 10 - requests it be made clear that the suggestion of trade does not indicate the Sugarloaf Range was at a tribal cultural boundary). If so, archaeological evidence in the form of knapped stone not locally available may be present. If the source of any extra-local stone can be traced to source the group with whom the Awabakal were trading could be identified;
- grooves resulting from axe, hatchet and adze grinding and resharpening are highly likely to occur in the proposed continued underground mining area on exposures of sandstone associated with creeklines;
- it is very likely that the proposed continued underground mining area was used by the local Awabakal people to procure a range of valuable subsistence resources and raw materials for use in manufacturing items of material culture. Based on the oral history, the ethnographic records and observations of current extant flora and fauna; the proposed continued underground mining area contains plants used to manufacture cord/string, various tree species used to manufacture clubs and boomerangs, Acacia and Xanthorrhoea species used for resin and food, Xanthorrhoea used for spear shafts, Melaleuca (paper bark) used to make vessels for carrying food and water as well as a range of prey animals such as wallabies;
- from observations of hunting parties it is likely that residual archaeological evidence such as stone artefacts may be located at the top of valleys; and
- as the proposed continued underground mining area has been impacted by previous land uses such as pastoral activity and forestry, it is assumed that the floral and faunal resources noted during the proposed continued underground mining area survey would have been even more abundant prior to European settlement of the area.

As summarised in **Section 3.0 Part C**, previous archaeological investigations within and in close proximity to the proposed continued underground mining area indicate that:

- the most likely archaeological evidence to survive within the proposed continued underground mining area are stone artefacts (flaking debris from the manufacture of stone implements) which have generally been previously exposed in highly disturbed

contexts such as on vehicle tracks, graded unsealed roads and areas mechanically cleared of vegetation, where ground surface visibility is favourable;

- the previously recorded artefact scatter sites have generally been recorded in areas of disturbance in association with watercourses and persistent water features (such as the wet soak);
- the previously recorded artefact scatter sites were small in terms of artefact numbers and areal extent;
- the previously recorded artefact scatter sites contained artefacts manufactured from tuff, silcrete and volcanic raw materials;
- grinding groove sites do occur in the proposed continued underground mining area where suitable sandstone platforms are found in association with watercourses; and
- the nature of the skeletal soils within the proposed continued underground mining area and surrounds mean that sites containing stone artefacts and grinding groove sites are likely to be effected by ongoing and active taphonomic processes such as erosion and mass movement of sediment.

In addition, in relation to the broader Sugarloaf Range area and the SSCA previous archaeological investigations and the DECCW AHIMS register indicates that:

- grinding groove sites are relatively common where suitable sandstone is located in association with creeklines;
- stone arrangements, while not common, do occur in the area;
- rockshelters are known but only one rockshelter with PAD has been recorded and this is not listed on the DECCW AHIMS and is not in the SSCA; and
- scarred trees have not been recorded in the SSCA.

3.9.2 Previously Proposed Models for Aboriginal Landscape Use and Site Location in the Sugarloaf Range Area

As a result of Aboriginal heritage and archaeological assessment of the proposed continued underground mining area and its environs several models for Aboriginal landscape use and site location have been proposed for the Sugarloaf Range. These are briefly summarised in **Sections 3.4.2.1 to 3.4.2.4.**

3.9.2.1 Umwelt 2003 in Consultation with ALALC

As part of an investigation into the cultural heritage values of the area known as the Minmi Corridors (centred on the township of Minmi but extending west to Mt Sugarloaf and south to Lake Macquarie) undertaken in consultation with ALALC, it was concluded that the Sugarloaf Range was of high Aboriginal cultural significance and high local and regional archaeological significance (Umwelt 2003b:5.38). This was due to the high number of grinding groove sites within the area, their generally excellent state of preservation and the fact that they provided insight into Aboriginal use of the landscape. The ridgelines of the area were identified as pathways between the swamp areas, coast and hinterland. The flora and fauna of the area was seen to have provided Aboriginal people with abundant resources for a large proportion of the year. The largely endemic vegetation was assessed as providing an insight into the type of environment Aboriginal people used and occupied prior to European settlement (Umwelt 2003b:5.38).

3.9.2.2 Umwelt 2005 in Consultation with ALALC and KLALC

Following an assessment of the Aboriginal heritage and archaeological values of the Southern Domain area the following interpretation of Aboriginal landscape use was proposed for the area:

- ridgelines provided easy walking routes and would have been used to access the Sugarloaf Range from the lower catchment/Lake Macquarie area;
- 'Major creek confluences often formed the focus for Aboriginal occupation' (Umwelt 2005:3). Creeklines in the Southern Domain probably formed the focus of hunting and gathering activities, including the grinding and resharpening of axes/hatchets; and
- '...this was 'passing though' territory for Aboriginal people...as they travelled between the Sugarloaf Range and Lake Macquarie...people did not stay in the area for long periods of time but rather carried out specific activities and returned to more permanent camps elsewhere near Lake Macquarie or adjacent to more substantial creeklines lower down in the catchment' (Umwelt 2005:3).

3.9.2.3 Umwelt 2006a in Consultation with ADTOAC, ALALC and ATOAC

After reviewing the archaeological and environmental context of the Western Domain and its environs it was observed that:

- axe grinding grooves in the region are generally located within the channels of drainage lines at the heads of valleys, in areas around rock pools on ridge tops, and on rock platforms near seepages (it is known that water was utilised as a lubricant during the grinding of axes) (Vinnicombe 1980, Dickson 1980, Umwelt 2004a);
- stone artefacts have generally been located on lower slopes/footslopes adjacent to creeks and on the ridgelines and spurs, which were used as the major thoroughfares allowing people access to and from the steep sandstone landscape (Vinnicombe 1980); and
- the existence of rockshelters in the Western Domain is also considered possible should suitable sandstone formations be present in the area. Shelters in the Narrabeen group sandstones are generally formed by the action of cavernous weathering (Twidale 1968, Twidale and Campbell 1993). Where large boulders or tall cliff faces of sandstone are found, cavernous weathering can produce shelters and caves large enough that they may have been used by Aboriginal people.

3.9.2.4 Umwelt 2006c in Consultation with ALALC

During the assessment of a power easement north-east of the proposed continued underground mining area it was proposed that Aboriginal people would most likely have focused their day to day subsistence activities in close proximity to swamps, the lower reaches of riparian corridors, alluvial creek valleys and in coastal areas with hunting and gathering parties utilising the whole region on a seasonal basis. Spiritual and ceremonial associations meant that accesses to the Mt Sugarloaf area and its surrounds may have been restricted and possibly only visited by initiated Elders (presumably men) (Umwelt 2006c:4.16).

3.10 Predictive Model

The proposed continued underground mining area has the potential to contain previously unrecorded archaeological evidence as well as sites/places of cultural significance to Awabakal people. The environmental context of the proposed continued underground mining area, the Aboriginal cultural knowledge and values, ethnography, previously recorded Aboriginal sites, previous archaeological assessments conducted within and in close proximity to the proposed continued underground mining area and previously proposed models for site location within the Sugarloaf Range; have all informed the following predictions for the nature and location of previously unknown Aboriginal archaeological sites and values within the proposed continued underground mining area.

It is predicted that:

- the mostly likely Aboriginal sites to occur are grinding grooves and sites containing stone artefacts (either artefact scatters or isolated finds);
- sites containing stone artefacts are likely to be located in association with creeks, ephemeral drainages or persistent water features ('wet soaks'). These artefacts are most likely to be visible in areas where ground surface visibility is favourable such as on vehicle tracks and areas of disturbance;
- stone artefacts may also be located on lower slopes/footslopes adjacent to creeks and on the ridgelines and spurs, which were used as the major thoroughfares allowing people access to and from the steep sandstone landscape;
- stone artefacts may also be expected to occur at the heads of valleys based on ethnographic accounts of hunting activity in the area;
- grooves from the grinding of axes, hatchets and adzes are known to occur within the proposed continued underground mining area and it is highly likely that further grinding grooves will be located within this area. Grinding grooves are generally located within the channels of drainage lines at the heads of valleys, in areas around rock pools on ridge tops, on rock platforms near seepages and on rock platforms within or alongside the drainage lines in the base of the valleys (it is known that water was utilised as a lubricant during grinding - Vinnicombe 1980, Dickson 1980, Umwelt 2004a). The grinding grooves may have associated pot holes that have been ground out to hold water for drinking and use while grinding;
- the flood event of June 2007 had the power to remove and transport sediments along the high flow ephemeral drainages and creeklines within the proposed continued underground mining area. The movement of this sediment load may have acted to expose grinding grooves in previously surveyed areas and may also have buried previously recorded grinding groove sites;
- the existence of rockshelters in the proposed continued underground mining area and immediate surrounds is considered possible should suitable sandstone formations be present (i.e. clifflines, large boulders), however, the majority of these will probably have no evidence of occupation;
- evidence contained within rockshelters (should they occur within the proposed continued underground mining area and immediate surrounds) may include stone artefacts and/or less likely, hearths either on the surface or within the floor deposits, grinding grooves and/or rock art (either pigment or engraved);

- rock art sites (including pigment and engraved art) though thought unlikely, may be contained within the proposed continued underground mining area and immediate surrounds should suitable geological features such as sandstone platforms and shelters occur. The engraving sites may occur on ridgelines on sandstone platforms with extensive outlooks and/or on platforms located at the heads of valleys (McDonald 2007, Vinnicombe 1980 XI: 6-7). Engravings may also be recorded on sandstone boulders and on vertical sandstone surfaces, most often in close proximity to water courses (McDonald 2007);
- Aboriginal oral history and ethnographic accounts suggest that burials marked by stone arrangements or crying trees could occur within the proposed continued underground mining area if mature trees remain;
- Aboriginal oral history suggests that scarred trees (some of which may be related to ceremony) could occur within the proposed continued underground mining area if mature trees remain;
- ethnographic accounts and the topography of the area, as well as previous regional models for Aboriginal landscape use within the Sugarloaf Range area suggest that the spurs and ridges would have provided access to, and negotiation of, the steep escarpment country and a travelway through the area to and from the swamp country in the north and the continuation of the steep escarpment country in the south/south-west. The spurs and ridges would have provided travel paths not only for the local Awabakal people but may also have provided access to other groups for whom entry into the area, possibly for trade or exchange as well as ceremonial activity was sanctioned by the Awabakal. Archaeological evidence of visitors to Awabakal traditional land may therefore occur in the proposed continued underground mining area in the form of stone artefact manufacture from stone sources outside Awabakal lands. Should such stone artefacts occur, identification of their provenance could indicate the group affiliation of past visitors into Awabakal country; and
- should a restriction of access to the Sugarloaf Range have arisen in relation to the stories related to 'Puttikan' (refer to **Section 3.0 Part B**) it may be reflected in the form of gendered material evidence (Umwelt 2006c) or differential frequencies of archaeological evidence may be observed between the range country and the lowlands.

4.0 Survey Methodology

The draft survey strategy employed for the proposed underground mining area was based on two factors; ground surface visibility within the proposed continued underground mining area and the nature of the impacts to Aboriginal sites that may result from underground mining. Based on these two factors, areas likely to contain site types which would be more heavily impacted by subsidence and any associated remediation works, and areas where ground surface visibility was likely to be higher, were preferentially targeted.

The following survey methodology was presented to the registered Aboriginal stakeholders as a draft for discussion in a workshop held prior to the commencement of the field survey (12 and 18 December 2008, refer to **Section 2.2** and **Appendix A**).

4.1 Proposed Methodology

The survey strategy proposed for the proposed underground mining area was in accord with the methodology used during the Western Domain assessment in 2006 (refer to **Section 5.0** for further details). In summary the survey strategy for the proposed underground mining area incorporated:

- a field survey strategy targeted towards the location of grinding groove or rockshelter sites (with evidence of use by Aboriginal people) that might have been present in the proposed underground mining area. These (sandstone) site types are considered to have the highest potential to be adversely impacted by subsidence following underground mining. Sandstone platforms, or large boulders on which grinding grooves occur, can crack due to subsidence (Nanson and Young 1983) and rockshelters and overhangs can develop tension cracking resulting in changes to rock surface hydrology, blockfall, accelerated chemical and physical weathering and/or total collapse (Lambert 1989) (for a more detailed discussion of the potential impacts of subsidence, refer to **Section 7.0**);
- landforms associated with watercourses within the proposed underground mining area were also selected as areas with higher potential to contain Aboriginal archaeological sites. In addition to the propensity for sandstone platforms that occur within creeklines to be used for the grinding of stone implements, artefact scatter and isolated find sites in the region have generally been located on lower slopes/footslopes adjacent to creeks. Creeklines are also likely to be impacted by mine subsidence through the need for remediation works (e.g. to correct ponding);
- due to the very dense vegetation and leaf litter in most landforms; roads, animal and motorcycle tracks within the proposed underground mining area were also targeted for survey as they provided enhanced ground surface visibility and covered topographic locations such as ridge and spur crests, which were known to have been used by Aboriginal people to negotiate the steeper areas of the sandstone country and which commonly had small artefact scatter sites resulting from this transient use; and
- opportunistic inspections were also undertaken during the proposed underground mining area assessment where areas of higher ground surface visibility, such as erosion scalds, and exposures of sandstone (either scree boulders, platforms or cliffclines) were observed.

The use of the same methodology during the current assessment meant that the results of both field surveys (the Western Domain survey and the current survey) would be directly comparable. Where assessed as appropriate by all participants, the results of the Western Domain survey were used to supplement the current survey.

The effective coverage (ground surface visibility and levels of disturbance) experienced in the Western Domain assessment was assessed as comparable to the conditions in the current project area. There had been no recent bushfires which would have afforded a greater opportunity for ground surface visibility in the Western Domain and though the June 2007 storm event may have altered the condition of creeks, this was thought unlikely to afford better opportunities for the detection of archaeological evidence, as the creeks located in the Western Domain were choked with very thick lantana and often had scree boulder morphology not suitable for grinding axes.

In summary, the proposed field survey methodology for the proposed continued underground mining area was to conduct a pedestrian field survey of areas within the project boundary (excluding the Western Domain which was assessed in 2006). The survey strategy proposed to target creeklines, lower slopes/footslopes adjacent to creeks and areas which afforded good ground surface visibility such as roads, animal and motorcycle tracks. The aim of the survey was to identify Aboriginal archaeological sites and landscape features of Aboriginal cultural value within the proposed continued underground mining area with a specific focus on identifying sites/features which were most likely to be impacted adversely by subsidence caused by underground mining and any subsequent associated remediation works.

During the workshops, Shane Frost from ADTOAC requested that some additional survey be undertaken in the Western Domain, specifically in the escarpment below the Sugarloaf Range in order to inspect any clifflines/shelters which may be present. Dene Hawken from ATOAC wished to clarify the nature of the field survey in terms of transect selection. It was agreed during the workshop (12 December 2008) that areas of the Western Domain not previously inspected would be inspected as part of the current survey and that the location of transects would not be pre-determined and would be selected by all fieldworkers collaboratively during the field program. The proposed survey strategy, including these two amendments, was endorsed by all registered Aboriginal stakeholders prior to the commencement of fieldwork (refer to **Appendix A**).

The final survey strategy was assessed as appropriate as it targeted the location of site types/features that were most likely to be adversely impacted by the project. While it is possible that Aboriginal sites may exist within the proposed continued underground mining area which may not be detected during the field survey, these are most likely to be comprised of isolated finds and small artefact scatters located on the slopes. These site types are unlikely to be adversely impacted through subsidence (including cracking and tilt) or through subsidence remediation works which are most likely to be restricted to creeklines and roads, both of which are targets for the survey.

5.0 Survey Results

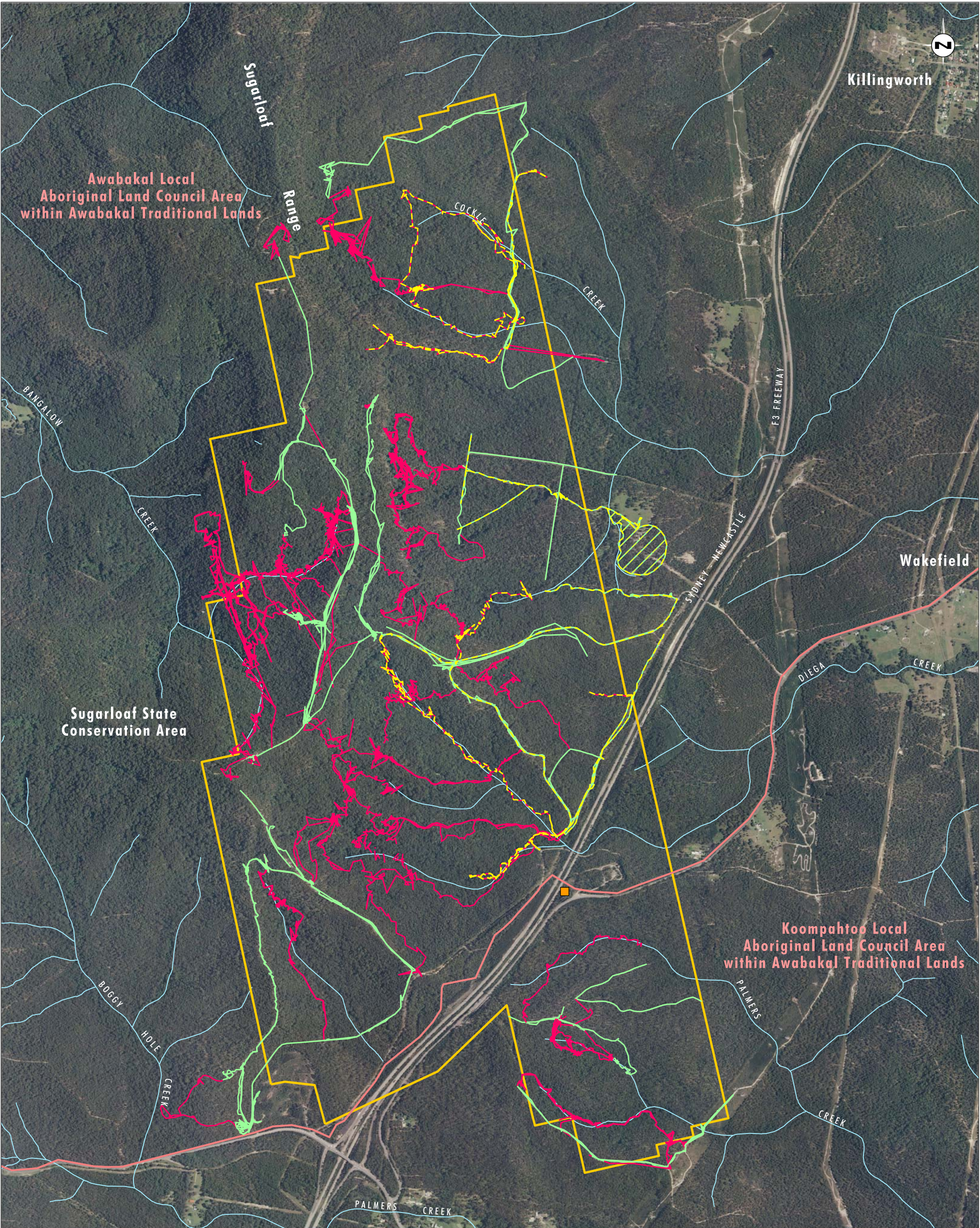
The results of the survey discussed in this section include some information derived from the Western Domain survey conducted in 2006 (Umwelt 2006a, refer to **Figure 5.1**). As discussed in **Section 4.1**, conditions experienced during the Western Domain survey in 2006 were comparable to those experienced in the current project area in 2009; hence survey coverage data from both field surveys is used to assess the proposed continued underground mining area. A total of 58.65 hectares was inspected during the Western Domain and current surveys with 62 Aboriginal archaeological sites (52 within the proposed continued underground mining area and 10 in proximity to its boundary) and 17 landscape features (14 within the proposed continued underground mining area and four in proximity to its boundary) of cultural significance identified.

5.1 Survey Coverage

The bulk of the field survey of the proposed continued underground mining area was undertaken between 9 February and 21 April 2009. One additional half day of survey was undertaken on 23 October 2009 to inspect an area proposed for a mining services facility and an adjacent road reserve proposed for the installation of four to five power poles. A total of 18.5 field days were undertaken. A total of 40.68 hectares of pedestrian survey was conducted. **Table 5.1** indicates the results for effective coverage for the 2009 survey which sampled all landform elements present within the proposed continued underground mining area (refer to **Figure 3.2** for landform elements).

Table 5.1 - Survey Coverage and Effective Visibility

Visibility	Landform Type	Total project area (ha)	Total in project area (m ²)	Visibility in Transect (%)	Total Area of Transect Available for Site Detection (ha)	Total Area of Transect Available for Site Detection (m ²)
Areas of poor visibility (due to very thick vegetation and leaf litter)	Disturbed Area	0.07	700	0	0.00	0
	Escarpment	2.85	2849.18	5	0.14	142.46
	Graded Track	0.00	0.00	0	0.00	0.00
	Knoll	0.04	41.65	2	0.00	0.83
	Major Spur	1.28	1275.75	0	0.00	0.00
	Mid Slope Bench	0.03	27.86	2	0.00	0.56
	Riparian Zone	4.74	4742.99	0	0.00	0.00
	Secondary Spur	5.24	5240.42	0	0.00	0.00
	Simple Slope	9.06	9060.75	0	0.00	0.00
	Steep Slope	1.64	1638.93	0	0.00	0.00
	Sugarloaf Range	0.87	874.24	2	0.02	17.48
Area of good visibility (i.e. on vehicle tracks, graded roads)	Disturbed Area	0.27	267.99	80	0.21	214.39
	Escarpment	0.10	96.32	90	0.09	86.69
	Graded Track	4.82	4820.43	80	3.86	3856.34
	Knoll	0.00	0.00	0	0.00	0.00
	Major Spur	3.50	3503.25	80	2.80	2802.60
	Mid Slope Bench	3.50	3503.25	80	2.80	2802.60
	Riparian Zone	0.21	207.29	70	0.15	145.10
	Secondary Spur	0.47	471.55	80	0.38	377.24
	Simple Slope	0.41	411.32	70	0.29	287.92
	Steep Slope	0.00	0.00	0	0.00	0.00
	Sugarloaf Range	1.58	1578.97	85	1.34	1342.12
Total		40.61	40612.14		12.08	12076.33



Source: OCAL - Aerial Photograph
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- LALC Boundary
- Drainage Line
- Western Domain Survey Transects
- Proposed Mining Services Facility

- Survey Coverage:
- Poor Visibility
 - Good Visibility

FIGURE 5.1
Survey Transects

As indicated in **Table 5.1**, ground surface visibility was extremely poor away from areas of disturbance such as roads and tracks. **Table 5.2** provides information in relation to the total area of each landform within the proposed continued underground mining area and the total area surveyed.

Table 5.2 - Total Area of Landform Available for Artefact Detection

Landform Type	Total of Landform within Project Area (ha)	Survey Coverage (Good Visibility ha)	Survey Coverage (Poor Visibility ha)	% of Total Landform sampled during Survey	Total Area of Landform Surveyed (ha)
Disturbed Area	43.45	0.27	0.07	0.06	0.34
Escarpment	83.96	0.10	2.85	0.35	2.95
Graded Track	15.56	4.82	0.00	3.10	4.82
Knoll	10.90	0.00	0.04	0.04	0.04
Major Spur	138.11	3.50	1.28	0.35	4.78
Mid Slope Bench	5.37	3.50	0.03	6.57	3.53
Riparian Zone	73.03	0.21	4.74	0.68	4.95
Secondary Spur	94.36	0.47	5.24	0.61	5.71
Simple Slope	549.32	0.41	9.06	0.17	9.47
Steep Slope	32.18	0.00	1.64	0.51	1.64
Sugarloaf Range	37.81	1.58	0.87	0.65	2.45
Total	1084.05	14.86	25.82	13.08	40.68

All exposures observed during the Western Domain and project area surveys were within vehicle tracks (graded and unsealed 4WD and motorcycle tracks) or within areas of other earthworks such as windrows and drains associated with graded vehicle tracks which are included in the 'disturbed category' (n.b. ATOAC 1 April 2010 - request that this level of impact on the Cultural Heritage values and landscape of country is of great concern to the Awabakal Traditional Owners). Also included in this category was the 0.7 hectare area proposed for the mining services facility. This area lies between Wakefield Road and the F3 Freeway (refer to **Figure 5.1**). The entire area has been heavily disturbed and consisted of a large mound of disturbed earth and rock pushed from the side of the Freeway during construction. The area also acts as a drainage point for the Freeway and has a pipe running beneath it and a large sump on the freeway side. This area has since revegetated with native species and garden escapes. Large amounts of rubbish and garden refuse were visible at the time of the survey.

Calculations of survey coverage do not take into account the percentage of exposure of the floor area of rockshelters inspected. In the case of rockshelters a thorough inspection was undertaken of the visible deposit and/or visible rock surface. It was observed that (where present) the sandy sediments which made up rockshelter deposits were reasonably stable with observed instances of bioturbation (such as kangaroo camps and wombat burrows) uncommon. All of the shelter deposits observed are estimated to be shallow (generally <50 centimetres in maximum depth). Weathering of the rock faces within shelters was observed to be relatively active and more so in shelters where the sandstone strata was interbedded with clay and conglomerate lenses.

Though ground surface visibility was poor due to vegetation and leaf litter for areas away from roads and tracks the survey did cover a good representative sample of the landform elements within the proposed continued underground mining area (refer to **Figure 5.1**). As

the main targets for the survey were grinding groove sites and rockshelter sites, poor ground surface visibility was not a deterrent to locating these site types and the cross-section of landform elements crossed by the roads and tracks provided sufficient exposure to gain a greater understanding of the distribution of artefact scatter and isolated find sites.

Other predicted site types such as scarred trees and stone arrangements were also able to be detected.

In addition to the survey coverage within the project boundary the land tenure of the proposed continued underground mining area (located largely within the SSCA) made areas immediately adjacent to the proposed continued underground mining area available for inspection. As illustrated on **Figure 5.1** during the course of the 2009 field program, 18.04 hectares of pedestrian survey were conducted immediately adjacent to, but outside of, the proposed continued underground mining area. For the most part these areas were sections of larger transects dictated by the topography of the proposed continued underground mining area and were walked as part of navigating around the landscape or were conducted at the request of ADTOAC and ATOAC in order to provide context to the sites recorded in the proposed continued underground mining area.

In total, 59.01 hectares of pedestrian survey was completed in relation to the project. The inspection of areas immediately adjacent to the proposed continued underground mining area has provided a better understanding of the Aboriginal use of the landscape and provided important contextual information for this assessment.

5.2 Landscape Features of Aboriginal Cultural Value Recorded During the Survey

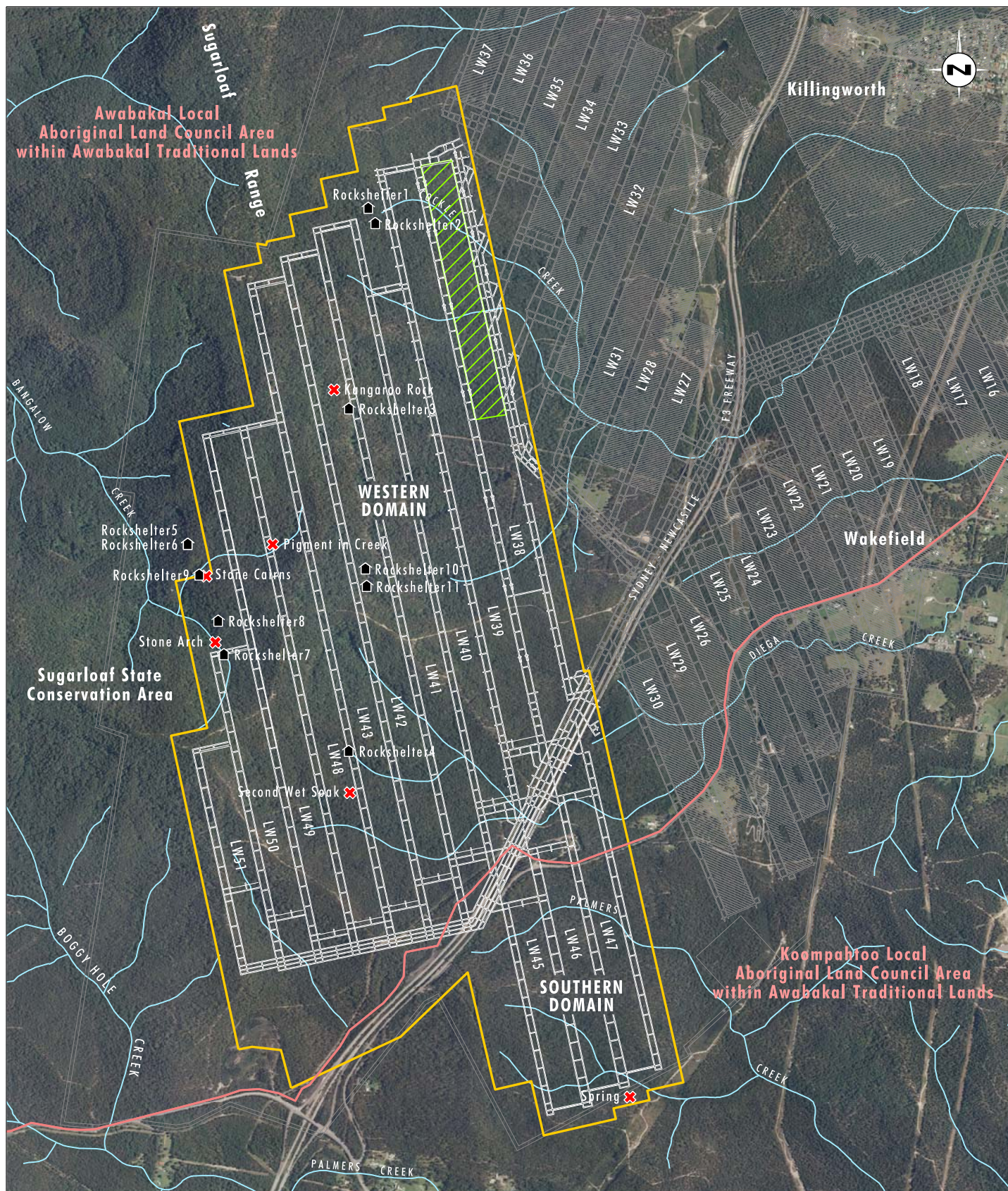
During the course of the survey a number of landscape features were recorded that were assessed by the ADTOAC and ATOAC as having high Aboriginal cultural value (refer to **Figure 5.2**). The features described within this section of the report represent landscape features that did not have associated archaeological evidence and thus they were not recorded as Aboriginal archaeological sites; however, as noted in **Section 1.5** and further discussed in **Section 2.4** the mine plans were modified in recognition of the Aboriginal cultural value of one of these features (a stone arch). This modification also led to the exclusion of Rockshelter 8 (not an Aboriginal archaeological site) from the proposed continued underground mining impact area. In addition, the mine plan modifications designed to avoid impact to the Western Domain 5 site (#38-4-0993) also protected two further rockshelters (Rockshelter 1 and 2). WWC has recognised the right of the ADTOAC and ATOAC to determine the cultural value of these landscape features and they have been treated in the same manner and given equal importance as the Aboriginal archaeological sites assessed within this report.

Each of the Aboriginal stakeholder groups¹³ has provided comment in relation to the cultural value of the landscape features described in **Sections 5.2.1 to 5.2.7**. The Aboriginal cultural value/significance of the landscape features will be discussed further in **Section 6.1**.

5.2.1 Spring

This natural spring is located in the Palmers Creek catchment (south-eastern fall of the Sugarloaf Range area), within the proposed continued underground mining area boundary but to the south, outside of the proposed longwall layout and thus outside the area to be subject to subsidence (refer to **Figure 5.2** and **Plate 4**). There were three locations within the

¹³ CCC (George Sampson 17 June 2010) has subsequently requested that its comments be removed from the main text



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines, DEC AHIMS

0 0.5 1.0 1.5 km
1:30 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- ✕ Feature of Aboriginal Cultural Value
- ⬛ Rockshelter of Aboriginal Cultural Value

File Name (A4): R03_V1/2553_234.dgn

FIGURE 5.2

Landscape Features of
Aboriginal Cultural Value

30 metre long by 20 metre wide spring area where water was seeping through the ground surface. Various species of microflora and algae indicate that these seepages are constant, though two visits to the area over the course of the survey showed that the spring flow is increased after extended periods of rain. Various species of rushes and sedges were also noted at the site. The rushes and sedges were only observed elsewhere in the proposed continued underground mining area at the two perched swamp (wet soak) features.

The Spring is Culturally significant to the Awabakal People and was one of several within our Traditional Country used as a natural resource for drinking and healing purposes (ADTOAC and ATOAC 17 March 2010).

ALALC considers these areas of cultural and environmental significance, many of the female sites are found within close proximity to these springs (ALALC 8 April 2010).

The spring would have been known about by the Awabakal people that travelled through this area and hunted and gathered in this area. It would have been an important place in the landscape as it would have guaranteed them fresh drinking water even during times when there was no water available in the creeks. It is still important as a teaching place (Lois Towney of KLALC - comments from meeting 9 March 2010).

5.2.2 Wet Soak (2)

A perch wetland or wet soak, very similar in nature and topographic context to the wet soak associated with artefact scatter WD5 (#38-4-0993) was recorded during the field survey (refer to **Figure 5.2** and **Plate 5**) in the Diega Creek catchment on the eastern fall of the Sugarloaf Range. The soak is defined by rush and sedge species occurring in a circular area approximately 10 metres in diameter. No surface water was present at the soak when it was recorded but water was found less than 15 centimetres below the ground surface. This is the second 'wet soak' feature found to occur within the proposed continued underground mining area and has an almost identical landform context to the first. The newly recorded wet soak is located on a small (20 metres wide by 50 metres long) bench associated with a secondary spur. The bench has created a mini catchment which overflows into a tributary of Diega Creek at the north-western end of the soak. The newly recorded wet soak is presumed to have the same sandy clay base as the wet soak located to the north on Cockle Creek (AHIMS #38-4-0993 – refer to **Figure 5.3** and **Section 5.3.3**), though the underlying sandy clay strata may not be as water tight as the persistence of water at the new soak seems less reliable than the soak associated with site WD5.

The Wet Soak (2) is culturally significant to the Awabakal People due to its unique nature. There are signs of use by our people as a resource area which can be easily identified by the scarred tree and artefact deposit within the immediate vicinity (ADTOAC and ATOAC 17 March 2010).

ALALC considers that [this wet soak is] of importance due to their association with ceremonial areas (ALALC 8 April 2010).

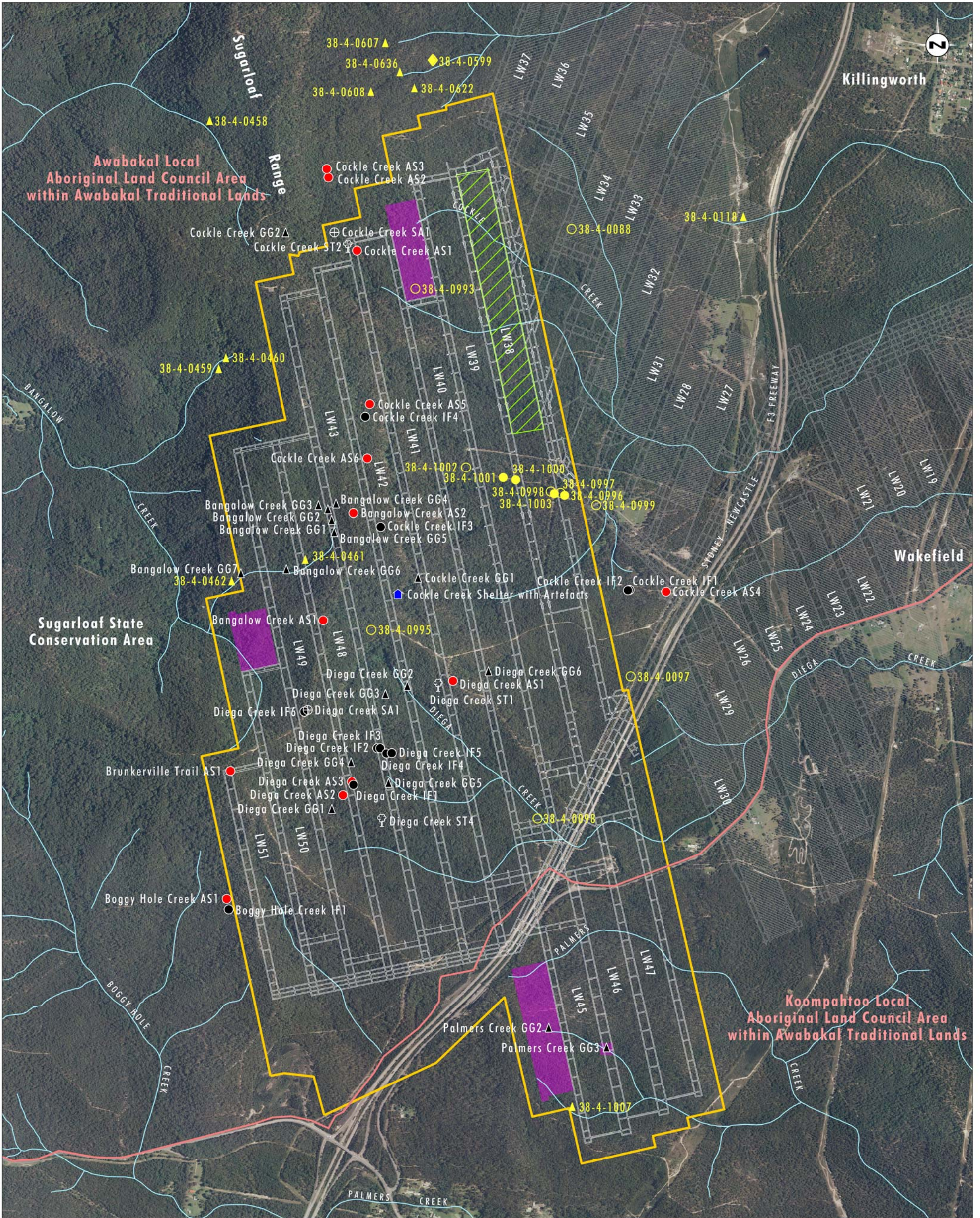
The wet soak would have been a valuable resource area for Awabakal people in the area. Many edible plants grow in and around the wet soak which would have been a valuable food resource. It is still a valuable teaching place (Lois Towney of KLALC - comments from meeting 9 March 2010).



PLATE 4
Spring identified as an Aboriginal cultural landscape feature of significance



PLATE 5
Second wet soak identified as an Aboriginal cultural landscape feature of significance



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- Artefact Scatter
- Isolated Find
- ▲ Axe Grinding Groove
- Shelter with Deposit
- ⊕ Stone Arrangement
- ⊗ Scarred Tree

- Previously Recorded Artefacts
- Artefact Scatter
 - Isolated Find
 - ▲ Axe Grinding Groove
 - ◆ Grinding Groove with Possible Art

FIGURE 5.3

New and Previously Located
Aboriginal Archaeological Sites

5.2.3 Pigment in Bangalow Creek

During a survey of Bangalow Creek (on the western fall of the Sugarloaf Range), Shane Frost (ADTOAC), observed 'pigment' in the bed of the creek (refer to **Figure 5.2** and **Plate 6**), at the unconformity of an overlying sandstone bed and the conglomerate underneath. The unconformity is located under a small sandstone overhang (4 metres wide, 1.2 metres high and approximately 0.75 metres in maximum depth) over which water flows to create a small waterfall. At the unconformity several different coloured claystone/unconsolidated tuff shales and iron-oxide rich sandstone clays including yellow, red, orange and rusty brown were observed. These 'pigments' varied in coarseness with the dark brown/red coloured claystone being the finest and the yellow, red and orange sandstone clay being the coarsest with macroscopically visible quartz grains throughout.

Approximately 15 to 20 metres downstream from these pigments a ball of rich red coloured castings derived from the interior of a termite mound was found adjacent to the creek bed. Processed castings from termites are known ethnographically and from geochemical studies to have been used by Aboriginal people as pigments (Watchman 1990).

This type of Pigment, as found in Bangalow Creek was a resource that was used by our People for Cultural Ceremony. It has high significance to all Awabakal People (ADTOAC and ATOAC 17 March 2010).

ALALC has no comment to make on the Pigment in Bangalow Creek (ALALC 8 April 2010)

The pigment could have been used for body painting for ceremony and could have been a valuable resource. It is still important for teaching (Lois Towney of KLALC - comments from meeting 9 March 2010).

5.2.4 Stone Arch

The 'Stone Arch' is a London Bridge shaped sandstone bar which measures approximately 2 metres in width and is approximately 20 metres long (refer to **Figure 5.2** and **Plate 7**). The arch is suspended across the creek bed of a tributary of Bangalow Creek at a height of approximately 5 metres. There is a waterfall in the creek approximately 7 metres upstream of the arch. In times of flow the waterfall would be framed by the stone archway. The stone archway is on the western fall of the Sugarloaf Range.

The Stone Arch is a significant landmark to our People, the Awabakal. It is a unique feature within the landscape which in our Cultural Heritage has a distinctive meaning related to and contributing to our Cultural beliefs (ADTOAC and ATOAC 17 March 2010).

ALALC has no comment to make on the Stone Arch (ALALC 8 April 2010)

The stone arch would have been, and still is, a very important and culturally significant feature within the landscape. A site used for protection and a valuable teaching place. (Lois Towney of KLALC - comments from meeting 9 March 2010).



PLATE 6
Pigment site in Bangalow Creek



PLATE 7
Stone arch identified as an Aboriginal
cultural landscape feature of significance

5.2.5 Stone Cairns/Stacks

Two small stacks of stones (one with two rocks and one with four rocks) were located on small (5 metre long by 1.5 metre wide) overhanging conglomerate platforms, located parallel to each other, either side of an ephemeral drainage flowing into Bangalow Creek on the western fall of the Sugarloaf Range (refer to **Figure 5.2** and **Plates 8a** and **8b**).¹⁴

Stone Cairns/Stacks have been used by our People as markers within the landscape so as to communicate specific meanings and/or instructions of a particular nature pertaining to that area (ADTOAC and ATOAC 17 March 2010).

ALALC has no comment to make on the Stone Cairns/Stacks (ALALC 8 April 2010).

KLALC has no comment to make on these small stone stacks (Lois Towney of KLALC - comments from meeting 9 March 2010).

5.2.6 'Kangaroo Rock'

This landscape feature is a sandstone boulder located upslope of the Cockle Creek Artefact Scatter 5 site (refer to **Section 5.3.3**, **Figures 5.2** and **5.3** and **Plate 9**) on a north/south running midslope bench on the eastern fall of the Sugarloaf Range. From one particular angle the boulder looks like the head of a Kangaroo.

Kangaroo Rock is a significant landmark to our People, the Awabakal. It signifies a particular cultural value pertaining to our Traditional Tribal Country. It is culturally inappropriate for us to elaborate further regarding this matter and we reserve the right as Awabakal People to abstain from commenting further due to the public nature of this document (ADTOAC and ATOAC 17 March 2010).

ALALC has no comment to make on the Kangaroo Rock (ALALC 8 April 2010)

The rock identified as Kangaroo Rock would have been an important landmark in the past for Awabakal people and a useful teaching place today and in the future (KLALC March 2010).

5.2.7 Rockshelters

Eleven rockshelters were located in cliff faces within (eight) and in proximity to (three) to the proposed continued underground mining area (refer to **Figure 5.2** and **Plate 10**). All were inspected during the field survey; however, only shelters at which artefactual material could be located were recorded as Aboriginal archaeological sites. It was; however, noted by Shane Frost (ADTOAC) and Dene Hawken (ATOAC), that the other shelters inspected and any further shelters that may occur across the proposed continued underground mining area (but were not located as part of the field survey), may have been used by Awabakal people in the past as temporary habitations or may have held cultural value to traditional Awabakal people.

¹⁴ The stacks/cairns were not recorded as an Aboriginal archaeological site as it was assessed that they were of such a fragile nature that they were most likely very recent and constructed by bushwalkers.



PLATE 8a
Stone Cairns identified as an Aboriginal
cultural landscape feature of significance



PLATE 8b
Stone Cairns identified as an Aboriginal
cultural landscape feature of significance



PLATE 9
'Kangaroo Rock' identified as an Aboriginal
cultural landscape feature of significance



PLATE 10
An example of a rockshelter identified as an Aboriginal cultural landscape
feature of significance (photograph courtesy of Dene Hawken)

The rockshelters are an integral part of our Awabakal landscape. They have been used by our People for many thousands of years making them an integral part of our Peoples lifestyle. Their significance can be attributed to their simple form which allows them to be used purely as a shelter but also allows them to be utilised for much more complex and multiple purposes so as to facilitate a variety of Cultural practices. They also have potential to contain PAD which is seen in Rockshelter known within this report as 'Cockle Creek Shelter with Artefacts'. This is why we consider all Rock Shelters to be culturally significant to the Awabakal People (ADTOAC and ATOAC 17 March 2010).

ALALC considers that most rockshelter where used, some for ceremonial purposes others for recreational purposes. Although no art work was found with in this particular rock shelter, this does not mean that the area is has no importance to the local Aboriginal community. Due to the proximity to the other cultural sites in the area, we believe this site did have a purpose and would have been used.

The rockshelters are big enough that a couple of people could have taken shelter out of the rain and their location in the landscape was probably well known to the Awabakal and they probably did use them for shelter (Lois Towney of KLALC - comments from meeting 9 March 2010).

5.3 Aboriginal Archaeological Sites Recorded During the Survey

At the completion of the survey there were 62 Aboriginal archaeological sites recorded within the proposed continued underground mining area and in its proximity (51 of the sites were within the proposed continued underground mining area). During the survey an additional five new sites were recorded that were located just outside the proposed continued underground mining area boundary to its north and west. An additional five sites were also previously known that were located outside the eastern boundary of the proposed continued underground mining area (refer to **Figure 5.3**). Each of the site types recorded during the survey/previously known within the proposed continued underground mining area and its proximity are described in this section of the report. Please note that grid coordinates have not been provided for the sites at the request of the participating Aboriginal stakeholder groups.

Site cards will be provided to the DECCW with the final report.

5.3.1 Potential for Archaeological Deposits

Within the following site descriptions the term 'potential archaeological deposit' (PADs) is used for places where the subsurface soil profile is assessed as having a high probability of containing cultural heritage materials in a relatively undisturbed context. Factors that need to be considered when assessing PADs include:

- the probability of cultural materials being present in a subsurface context as assessed through the environmental setting and/or a surface artefact assemblage;
- the predicted density and complexity of that material (e.g. would the analysis of the material assist with gaining a greater understanding of the Aboriginal use of that landscape);
- the significance of the artefacts predicted in a subsurface context in terms of their ability to answer research questions aimed at gaining a greater understanding of Aboriginal

social interaction (e.g. is the deposit likely to contain raw materials that could be sourced using petrological (thin sectioning) or geochemical (XRF¹⁵, XRD¹⁶) analysis to provide information related to trade and/or exchange);

- disturbances to the soil profile (e.g. track construction and use, vegetation clearance, logging, animal and insect burrowing, stock trampling, power easement clearance, 4WD and motorbike damage etc.); and
- any geomorphic agencies likely to have affected the area causing soil degradation and/or aggradation (e.g. slopewash, slumping, rilling, gullyng).

5.3.2 Grinding Groove Sites

A total of 19 grinding groove sites were located within the proposed continued underground mining area and one additional grinding groove site was recorded to the north and just outside the proposed continued underground mining area boundary (refer to **Figures 5.3** and **5.4**). Three of the 20 grinding groove sites were previously recorded and 17 were newly recorded sites. The large number of grinding groove sites within the proposed continued underground mining area (and within the Sugarloaf Range area in general – refer to **Tables 3.3** and **3.5** and **Figure 3.4**) indicates that the sandstone outcropping in the area was a valuable resource to the Awabakal people.

In order to ascertain if the grinding grooves could provide further information in relation to Aboriginal use of the landscape of the proposed continued underground mining area, the morphology of the grooves (shape, length, width and depth) was recorded in order to understand the types of implements being ground (e.g. stone axes, stone hatchets, stone chisels, fire hardened wooden points, bone points or food/ochre preparation) and the estimated time expended on grinding at each of the sites.

Other aspects recorded included the patterning of the grooves within the sites in order to ascertain the minimum number of seating positions used to undertake the grinding. This information was recorded in order to try and gain a greater understanding of the number of people that may have been involved in the grinding process at each site. The length of the grooves was also used to suggest how many different people (of different arm lengths) were involved.

The varying degree of weathering of the grooves within the sites was also compared to assess how many grinding episodes may have been represented by the grooves, however, differential weathering patterns due to the amount of waterflow and sediment load that the grooves had been exposed to, meant that in most cases the preservation of the grooves was a poor indicator of age. The depth of the grooves was therefore used instead to suggest if return visits had been made to the sites to sharpen stone implements.

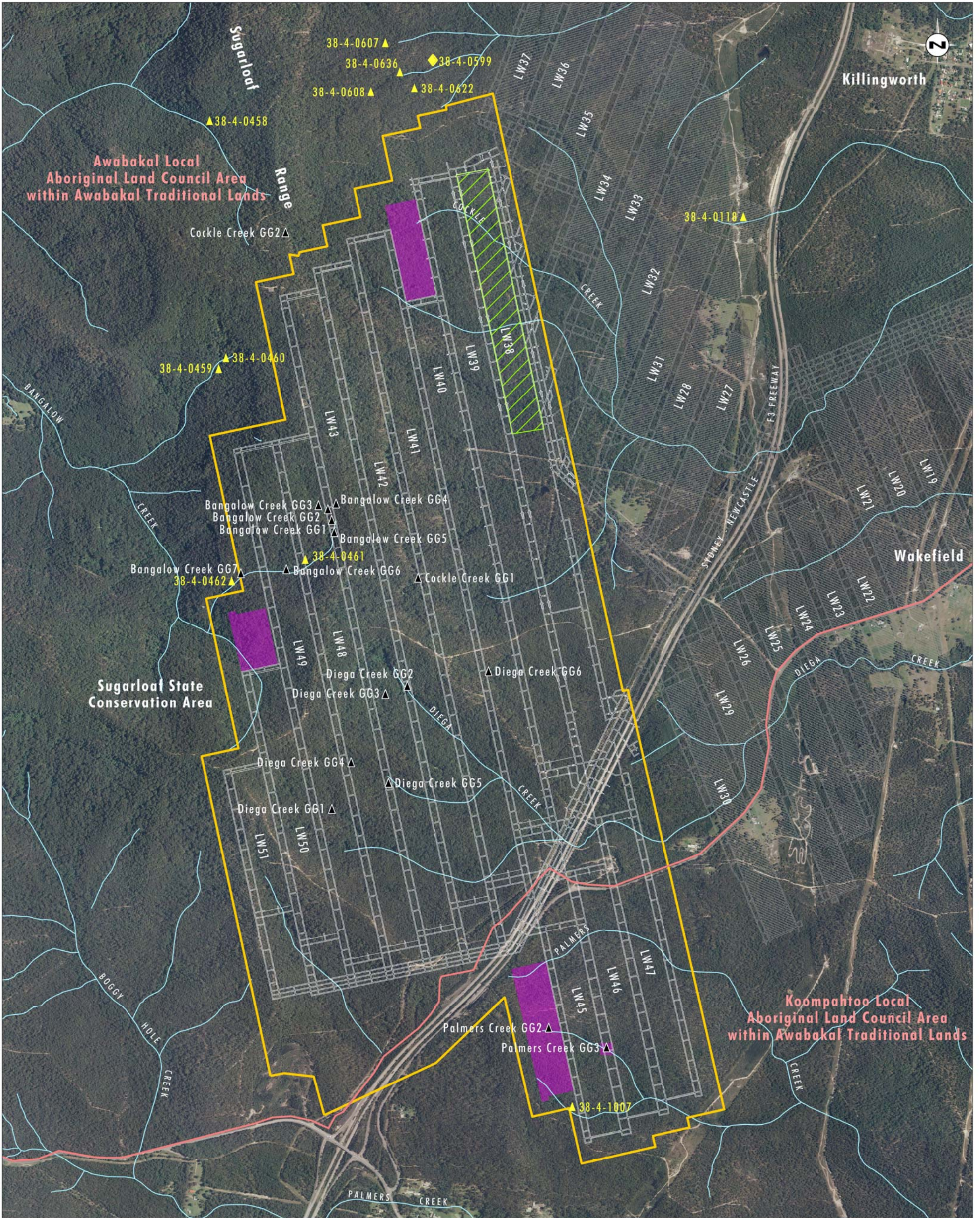
In order to be able to make these determinations information gathered from experimental archaeology was used.

Experimental Axe Production/Edge Grinding

Dickson (1980) and Wilson (1994) undertook experimental studies related to the manufacture, grinding and use of stone implements. Both of these studies will be utilised to interpret the evidence provided by the 20 grinding groove sites recorded/rerecorded during the survey. It should be noted that sandstone varies greatly in its suitability as a grinding tool. Coarse, quartz rich, sandstone with a relatively unconsolidated clay matrix will sharpen more

¹⁵ X-ray Fluorescence

¹⁶ X-ray Diffraction



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

Continued Underground Mining Area

Longwall Progression

LALC Boundary

Proposed Underground Workings

Former Underground Workings

Drainage Line

Revised Layout for Archaeology and Groundwater

▲ Axe Grinding Groove

Previously Recorded Sites

▲ Axe Grinding Groove

◆ Grinding Groove with Possible Art

FIGURE 5.4

New and Previously Recorded
Grinding Groove Sites

effectively than a lithic sandstone that has finer grain size and is more consolidated. The reason for this is that in order for grinding to proceed efficiently the sandstone needs to shed the quartz grains as they become worn so that fresh angular quartz grains become exposed to aid in the grinding process.

Within the current project area the sandstone is relatively coarse and quartz rich and provides a good grinding surface (it is noted that the sandstone is interbedded with conglomerates which are totally unsuitable for grinding due to the large size of the pebbles within its matrix). Thus grinding times should not extend beyond the average recorded by Wilson (1994).

Both Dickson (1980) and Wilson (1994) found that stone implement manufacture was assisted by the availability of water to rinse the groove clean during the grinding process. Rinsing the groove removed the build up of ground material which otherwise would act to lubricate the groove and lessen the ability of the fresh sandstone grains to grind away the surface of the implement as intended. Thus grinding in areas with running water was preferred.

Wilson (1994) used her experimental studies as a method of interpreting edge ground stone implements held in private, university and museum assemblages. As part of her work she undertook detailed recordings of the size and shape of the stone implements and the reduction techniques used in their manufacture. Wilson then manufactured similar implements using the same raw materials and reduction techniques. Wilson recorded the time taken to reduce the raw material to a form where it was ready for edge grinding and the amount and morphology of the debitage produced during the stages of reduction (namely block reduction, reduction to a blank, reduction to a preform). She then recorded the time taken to grind the cutting edge of the implements manufactured and the morphology of the resultant grinding grooves (length, width, depth, shape).

Wilson (pers. comm. 2009) found it likely that each grinding groove related to the preparation of the cutting edge of only one stone implement (and perhaps its subsequent resharpening - as long as the cross section of the implement remained relatively unchanged); as the shape of the groove created is unique to that particular stone implement and is not generally suitable for grinding a different implement. Dickson (1980: 156) also concluded:

Repeated use of the longitudinal kind of grinding groove formed in sandstone ... can be successfully done if subsequent heads have breadths that fit the groove.... Experiment suggests that not more than two or three axe heads can practically be ground in a single groove before it becomes inconveniently deep with a risk of skinning the fingers grasping the head. The existence at various sites of considerable numbers of relatively shallow grooves side by side appears to confirm the suggestion that a grinding groove has a limited useful life.

For the discussions related to the sites presented in **Sections 5.3.2.1 to 5.3.2.20** the following definitions apply:

- adze – a handheld wood working tool manufactured from stone with a cylindrical cross-section and an asymmetrical ground working edge. Generally between 3 and <5 centimetres in width at the working edge;
- hatchet – a hafted chopping tool (small axe) manufactured from stone that was generally lenticular to rectangular in cross-section with a symmetrical ground cutting edge, which was used with one hand. Generally between 4 centimetres and 8 centimetres in width at the cutting edge; and
- axe – either handheld or hafted chopping tool manufactured from stone that was generally lenticular to rectangular in cross-section with a symmetrical ground cutting

edge, which was used with two hands. Generally greater than 8 centimetres in width at the cutting edge. Axes greater than 10 centimetres width at the cutting edge are assessed as being large axes.

The above generalisations have been drawn from the measurements taken by Wilson (1994) and the results of experimental grinding and use of the stone implements. It is noted that there is an overlap between the width of adzes and hatchets but the shape of the grooves created by an adze is generally rounder than those created by hatchets which are more lenticular.

During her study Wilson noted that whilst length and weight of these implement types decreased due to resharpening episodes, that width and to an even greater degree thickness, remained fairly constant throughout the useable life of the implement. The grinding grooves recorded in the proposed continued underground mining area during the survey provide evidence of the width of the cutting edge being ground and thus an indication of the most likely implement being ground (it should be noted that an axe can eventually be ground down through resharpening to a size where it becomes a hatchet). Tables in **Sections 5.3.2.1 to 5.3.2.20** provide data related to the length, maximum width and maximum depth of the grinding grooves (due to the rocking action employed when grinding, the grooves become narrower and shallower at each end).

Wilson's experimental work (Wilson pers. com. 2009) suggests that the average depth of a groove on sandstone from 3 hours of grinding to create new cutting edge on a stone implement was around 1.5 to 1.8 centimetres. Deeper grooves were formed when the same axe was resharpened in the same groove when it had become broken or blunt from use. If a new area of sandstone was chosen to resharpen an axe it generally resulted in a shallower (often <1 centimetre in depth) and sometimes a shorter groove (<20 centimetres).

The length of Wilson's experimental grooves for initial edge grinding of a cutting edge was 30 to 35 centimetres, whilst those measured within numerous grinding groove sites ranged between 20 and 40 centimetres (the length of the groove depends on the length of the arms of the person doing the grinding or in some cases is limited by the space on the rock outcrop on which they are grinding).

During the survey a number of grooves were located that did not fit the dimensions expected for grinding axes, hatchets or chisels. These grooves were either very narrow and elongated relative to their width, or short relative to their width. These grooves were assessed as not resulting from the grinding of stone implements but more likely to have resulted from other uses, such as grinding of fire hardened wooden points (relatively long and narrow) or from grinding plant foods (rounder and more bowl-like). An additional set of grooves was interpreted, with the assistance of the registered Aboriginal stakeholders (refer to **Section 5.3.2.11**), as representing direction markers, rather than having resulted from some form of implement sharpening/resharpening.

For the following site interpretations it has been assumed that each groove belongs to a single implement as this appears to be the norm from experimental studies. Where the grooves are deeper than expected to produce a cutting edge, resharpening of the same implement is assumed. Where the groove is shallower than expected to produce a cutting edge, resharpening (only) is assumed. It is stressed that the interpretations provided are generalised assumptions and that they have been included in order to gain a greater understanding of what behaviours are reflected by the grooves and thus to gain a greater understanding of the use of the area by Awabakal people and to place the Aboriginal people back into the archaeological record.

5.3.2.1 Bangalow Creek Grinding Grooves 1

Bangalow Creek Grinding Groove 1 contained four grinding grooves which were located on a sandstone bench in an upper tributary of Bangalow Creek on the western fall of the Sugarloaf Range (refer to **Figure 5.4**). The grooves were located over a small area measuring 0.5 metres by 0.5 metres on the upstream side of a break in slope in the sandstone creek bed with a small waterfall on the downstream side. There was a small pool immediately upstream which would have provided water to assist the grinding process for a short period after rain (refer to **Plate 11**).

Based on experimental data the morphology of the grooves suggests the most likely scenario is that two axes had new cutting edges ground, and that one of these was possibly reground on subsequent visits; that one of the grooves was probably used to resharpen an axe; and one was used for creating a new cutting edge on a hatchet and subsequent resharpening (refer to **Table 5.3**). The grooves represent approximately 15 hours of grinding.

Table 5.3 - Morphology of Grooves in Bangalow Creek Grinding Grooves 1

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
29	9.5	3	Elliptical shaped deep groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
22	8	1.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge	3
23	8	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
21	6	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
Total 2 axes new cutting edges ground, 1 reground; 1 axe resharpened and 1 hatchet new cutting edge and resharpening					15

The grooves could have been created from a minimum of two seating positions. Taking into account the varying activities taking place it is suggested that the length of the grooves indicates that two different people may have ground at this site. The condition of the grooves is good with all grooves similarly weathered.

There were no surface artefacts located in association with the Bangalow Creek Grinding Grooves 1 site. It is possible that adjacent areas of low gradient may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups. Thus, it is assessed that areas of low gradient associated with the grinding grooves are likely to retain PAD.

5.3.2.2 Bangalow Creek Grinding Grooves 2

A total of 10 grinding grooves were located at this site on a large sandstone exposure that extends upstream and downstream of the site in an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Figure 5.4**). Nine of the grooves were located in a cluster 1.5 metres by 1 metre in area on the edge of a sandstone bench/small

waterfall (refer to **Plate 12**). These grooves are in good condition. The tenth groove was in the creekbed two metres downstream (north-east) of the cluster. This groove was more weathered than the other grooves in the site.

For a short period after rain the grooves would be within the area of waterflow. There were also several small potholes in association with the main cluster of grooves that would have held water for a longer period after rain for use during the grinding process. There was also a small sandstone plunge pool below the waterfall which would hold water for a much longer period after rain.

Based on experimental data the morphology of the grooves suggests that nine axes had new cutting edges ground, eight of these were subsequently resharpened and one axe was resharpened only (refer to **Table 5.4**). The length of the grooves suggests up to four people grinding. The location of the grooves indicates at least four different seating positions were used for grinding at this site. The grinding at the site would have taken approximately 53 hours and would have been undertaken over a multiple visits.

Table 5.4 - Morphology of Grooves in Bangalow Creek Grinding Grooves 2

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
24	8.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
34	12	3	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	6
28	9	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
28	8.5	2.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
32	10.5	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
29	10	2.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
35	9.5	3	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	6
37	9.5	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
23	9	3	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	6
29*	10	2.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
Total 9 axes had new cutting edges ground, 8 of these were subsequently resharpened and one axe was resharpened only					53

*Groove is too weathered for the maximum extent to be measured. This measurement is the maximum extant length of the groove.



PLATE 11
Bangalow Creek Grinding Grooves 1



PLATE 12
Bangalow Creek Grinding Grooves 2

The differential weathering of the grooves suggests that the north-eastern-most groove is older than the nine grooves clustered upstream. Based on the differential weathering, the morphology of the grooves and possible seating positions the grooves at this site could have been created by four or more individuals and most likely represent at least four grinding episodes.

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 2 site. It is possible that adjacent areas of low gradient may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups. Thus, it is assessed that areas of low gradient associated with the grinding grooves are likely to retain PAD.

5.3.2.3 Bangalow Creek Grinding Grooves 3

The site consists of five grinding grooves in a cluster over an area approximately 0.5 metre by 0.5 metre in an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Plate 13** and **Figure 5.4**). The two northern-most grooves are situated in the area of more constant water flow and the north-west end of the grooves are worn away due to erosion.

Based on experimental data the morphology of the grooves suggests that three axes had a new cutting edge ground and these same axes were resharpened on subsequent visits. Two of the grooves suggest grinding a new edge on a smaller hatchet and the resharpening of those hatchets on subsequent visits (refer to **Table 5.5**).

Table 5.5 - Morphology of Grooves in Bangalow Creek Grinding Grooves 3

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
14*	7	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	3.5
26*	9	3	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	6
28	8	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
25	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	5
24	8.5	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
Total 3 axes, 2 hatchets multiple resharpening episodes					24.5

*Groove is too weathered for the maximum extent to be measured. This measurement is the maximum extant length of the groove.

There are at least two seating positions possible at this site and two individuals could have ground simultaneously and the slight differences in the length of the preserved grooves, suggests two different individuals grinding. Differential weathering of the grooves is assessed as resulting from differential exposure to the flow of water and is not thought to represent a temporal distinction between grinding episodes. The grooves represent multiple visits to the site and around 24.5 hours of grinding.

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 3 site. It is possible that adjacent areas of low gradient may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups. Thus, it is assessed that areas of low gradient associated with the grinding grooves are likely to retain PAD.

5.3.2.4 Bangalow Creek Grinding Grooves 4

The site consists of one grinding groove and a shallow bowl-like depression in the sandstone bed of an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Plate 14** and **Figure 5.4**). The groove and depression are approximately 1 metre apart.

Based on experimental data the morphology of the bowl-like depression suggests that it has not resulted from the grinding of a stone implement but more likely represents the use of an existing shallow depression in the rock surface to grind food (seeds, roots, macrozamia nuts) or ochre. The morphology of the other groove suggests it resulted from the grinding of a new cutting edge on a hatchet and one resharpening event (refer to **Table 5.6**).

Table 5.6 - Morphology of Grooves in Bangalow Creek Grinding Grooves 4

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
33	16	2	Elliptical bowl-shaped groove 'U' shaped in cross section but very broad and flat	Most likely resulted from the use of an existing depression in the rock for food or ochre preparation	No data available to assess time
28	7	2	Elliptical shaped 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	2
Total 1 food/ochre processing bowl and 1 hatchet and at least one resharpening					2+

It is possible that the bowl and groove were made simultaneously by two different individuals. The depth of the hatchet groove is likely to represent two grinding episodes, while it is not possible based on current knowledge of food/ochre grinding (and without knowing the original depth of the natural depression) to assess how much time would have been involved in the manufacture of the bowl-like depression. The lengths of the grooves indicate that they were probably made by at least two different individuals.

The grooves appear quite worn, but as they are in an area where waterflow would act to erode them quickly, this does not suggest they are extremely old.

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 4 site and due to the gradient of the adjacent slopes it is not thought likely that artefacts will occur in a subsurface context.

5.3.2.5 Bangalow Creek Grinding Grooves 5

The site consists of 40 grinding grooves in the bed of an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Figure 5.4**). The grooves are in an area approximately 22 metres long by 2 metres wide. The grooves are located in three clusters along the creekbed, with 10 to 15 grooves per cluster (refer to **Plates 15** and **16**).



PLATE 13
Bangalow Creek Grinding Grooves 3



PLATE 14
Bangalow Creek Grinding Grooves 4



PLATE 15
Bangalow Creek Grinding Grooves 5



PLATE 16
Bangalow Creek Grinding Grooves 5

The grooves are situated on the south-western edge of the creek bed between small ponds of water and potholes.

Based on experimental data the morphology of the grooves at this site suggest that 24 axes had new cutting edges ground and were subsequently resharpened, two axes had only new cutting edges ground and three were only resharpened. Six of the total of 29 axes were large. Five hatchets had new cutting edges ground and were subsequently resharpened, five had new cutting edges ground only and one was just resharpened. The approximate time all the grinding would take is 198 hours spread over multiple visits to the site (refer to **Table 5.7**).

Table 5.7 - Morphology of Grooves in Bangalow Creek Grinding Grooves 5

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
30	10	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
32	10.5	3	Elliptical shaped groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	6
34*	11	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	5
27	8.5	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
35	12	4	Elliptical shaped deep groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	8
35	10	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
36	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
30	9.5	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
26	8	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe – one resharpening	2
40	9	4	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	8
32	8	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
32	9.5	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
30	7.5	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	3
32	8	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
31	10	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	5
33	10	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
25	7.5	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4

Table 5.7 - Morphology of Grooves in Bangalow Creek Grinding Grooves 5 (cont)

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
33	10.5	2	Elliptical shaped groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	4
38	9.5	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
39	12	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	7
23	8	4.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	9
27*	9*	4	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	8
26	9.5	4.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	9
25	8	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	7
33	8.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
31*	7	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	3
34	8	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
27	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
24	8.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
28	8	3	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	6
23*	6.5	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
30	7.5	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
33	10.5	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Axe – large - new cutting edge and resharpening	7
24*	7.5	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
24	7.5	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	3
22*	7	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
29	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
20*	7.5	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	3

Table 5.7 - Morphology of Grooves in Bangalow Creek Grinding Grooves 5 (cont)

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
22	7	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	3
26	9	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
Totals 29 axes and 11 hatchets and multiple resharpening episodes					198

*Groove is too weathered for the maximum extent to be measured. This measurement is the maximum extant length of the groove.

Seating positions could not be determined due to the number and placement of the grooves, however, the varying lengths of the grooves suggests that at least four or five people were involved. The grooves range from being in good to poor condition. The varying degrees of weathering are most likely related to the flow of water over the sandstone rather than relating to large differences in the time at which the grooves were made.

This site had the highest number of grinding grooves recorded within the proposed continued underground mining area and the highest total hours of grinding predicted to produce the grooves.

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 5 site. It is possible that adjacent areas of low gradient may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups. Thus, it is assessed that areas of low gradient associated with the grinding grooves are likely to retain PAD.

5.3.2.6 Bangalow Creek Grinding Grooves 6

This is a single groove (maximum dimensions 15 centimetres long by 6 centimetres wide by 1.5 centimetres deep) within a natural depression (25 centimetres long by 10 centimetres wide by 3 centimetres deep) located in the sandstone of the creekbed of an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Figure 5.4**). The measurements of the groove are within the range for grinding a new cutting edge on a hatchet (taking into account its location in a natural depression). It is assessed that approximately 3 hours of grinding are represented by the groove. The ground depression is associated with a rock pool which would have provided water to assist with the grinding process (refer to **Plates 17a** and **17b**). The groove is in fair condition.

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 6 site and due to the gradient of the adjacent slopes it is not thought likely that artefacts will occur in a subsurface context.

5.3.2.7 Bangalow Creek Grinding Grooves 7

The site consists of four grinding grooves over an area approximately 3 metres by 2 metres in the sandstone creekbed of an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Plate 18** and **Figure 5.4**). Three of the grooves are in a cluster to the south, while the fourth groove is located on a sandstone platform next to a pool of water.



PLATE 17a
Bangalow Creek Grinding Grooves 6



PLATE 17b
Bangalow Creek Grinding Grooves 6



PLATE 18
Bangalow Creek Grinding Grooves 7

Based on experimental data the morphology of the grooves at this site suggest that two axes had new cutting edges ground and were subsequently resharpened, one hatchet had a new cutting edge ground and one hatchet had a new cutting edge ground and was subsequently resharpened. One of the axes was large. The approximate time all the grinding would take is 18 hours spread over multiple visits to the site (refer to **Table 5.8**).

Three seating positions are likely at this site and the length of the grooves suggests at least two different people ground at the site. The grooves were in good condition.

Table 5.8 - Morphology of Grooves in Bangalow Creek Grinding Grooves 7

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
28	8	2	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
25	7	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge	3
28	7.5	3	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	6
33	10	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – large -new cutting edge and resharpening	5
Totals 2 axes and 2 hatchets and multiple resharpening episodes					18

There were no surface artefacts located in association with the Bangalow Creek Grinding Groove 7 site and due to the gradient of the adjacent slopes it is not thought likely that artefacts will occur in a subsurface context.

5.3.2.8 #38-4-0461

The site is located in an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Figure 5.4**). This site was originally recorded by Warren Bluff in 1997 as 'four AGGs on platform in creek bed'. No details were provided on the site card of the dimensions of the grooves. The photograph provided with the site card (refer to **Plate 19**) shows two grinding grooves in fair condition.

During the 2009 survey, three grooves were recorded at this site and a fourth very vague outline of a groove was noted (the latter groove could not be measured) on a sandstone bench between two pools of water. A comparison of the photograph taken by Bluff with the site area indicates that this is the same site.

Based on experimental data the morphology of the grooves at this site suggest that one axe and two hatchets had new cutting edges ground and that the axe and one of the hatchets was subsequently resharpened. It is not possible to provide information on the remaining groove, however, based on the visible grooves at least 12 hours had been spent at the site grinding (refer to **Table 5.9**).

Table 5.9 - Morphology of Grooves in #38-4-0461

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
28	8	2	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
28	7.5	3	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	6
25	7	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - new cutting edge	2
Totals 1 axe and 2 hatchets new edge ground, axe and 1 hatchet resharpened					12+

Only one seating position is likely at this site and only one to two people are indicated by the length of the grooves.

There were no surface artefacts located in association with the #38-4-0461 site and due to the gradient of the adjacent slopes it is not thought likely that artefacts will occur in a subsurface context.

5.3.2.9 #38-4-0462 Grinding Grooves and Associated Rockshelter

This site, in an upper tributary of Bangalow Creek and on the western fall of the Sugarloaf Range (refer to **Figure 5.4**), was initially recorded by Warren Bluff in 1997 as '16 axe grinding grooves above a waterfall in the creek' (refer to **Section 3.0 Part C**). When the site was inspected in February 2009 most of the grooves were submerged in a rockpool just above the 'waterfall' and it was only possible to record eight grinding grooves (refer to **Plate 20**). When the site was revisited during April 2009, 12 grooves were visible, dimensions for these are included in **Table 5.10**. The dimensions or preservation of the grooves could not be compared with the previous 1997 recording, as this information was not provided on the site card. The grooves observed were in fair to good condition.

Due to discrepancies between the GPS coordinates recorded by Bluff and those recorded by Umwelt this site (and the other Bangalow Creek grinding groove sites) were subject to a detailed survey. The surveyors and Umwelt plotted the site approximately 200 metres downstream and to the south-west of Bluff's location and outside the proposed continued underground mining area.

Based on experimental data the morphology of the grooves at this site suggest that five axes had new cutting edges ground and that three of these were subsequently resharpened. Seven hatchets were ground at the site. Three of these had new cutting edges ground and were subsequently resharpened and four were only resharpened at the site. It is not possible to provide information on the remaining four grooves that were submerged, however, based on the visible grooves at least 39 hours had been spent at the site grinding.



PLATE 19
38-4-0461 (photograph from DECCW site card)

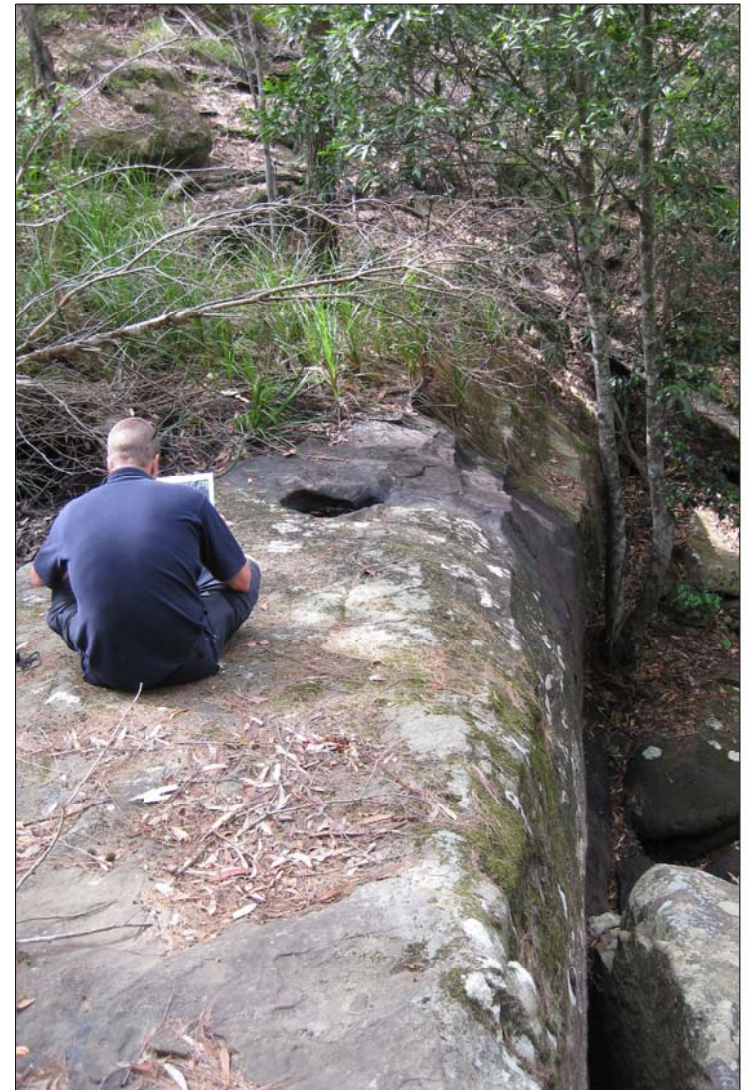


PLATE 20
38-4-0462 Grinding Grooves

Table 5.10 - Morphology of Grooves in #38-4-0462

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
14*	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
27*	7	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
30	7.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
31	7.5	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	4
10*	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
18*	10	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
26.7	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
31	9	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
29	9	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
28	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	5
31	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge and resharpening	5
33	8	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
Totals 5 axes, 7 hatchets multiple resharpening episodes					39

*Groove is too weathered for the maximum extent to be measured. This measurement is the maximum extant length of the groove.

It was not possible to suggest seating positions at this site due to their placement on the rock and the submersion of the some of the grooves.

Immediately below the waterfall on the western side of the creek channel, there is a shelter which has been created by the collapse of a sandstone bench (refer to **Plate 21**). The shelter does not contain any deposit, (the floor of the shelter is gravels and boulders), though several of the sandstone boulders/slabs with flat tops would provide comfortable places to sit/lay inside the shelter. The shelter is not very large approximately 1.2 metres in height, 1 metre in width and 1.2 to 1.5 metres in depth) but could accommodate two adults comfortably. A small quartzite hammerstone with pitting on the left and right lateral margins equidistant from the top and bottom of the stone was recorded sitting on one of the flat sandstone slabs towards the back of the shelter.

There were no further surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain.

The shelter was not recorded by Bluff and a revised site card will be prepared for the DECCW to provide further information on the shelter and the problems with the GPS coordinates.



PLATE 21
38-4-0462 Rockshelter

5.3.2.10 #38-4-1007 (Palmers Creek 1)

The Palmers Creek 1 site contained 34 grinding grooves located on a sandstone platform in the creekbed of a tributary in the upper catchment of Palmers Creek (on the south-easterly fall of the Sugarloaf Range) (refer to **Plates 22** and **23** and **Figure 5.4**). This site was first recorded in 2005 (Umwelt 2006b). The grooves were noted to be in good condition and occurring in groups of between three and five grooves.

Based on experimental data the morphology of the grooves suggests that 22 axes and 12 hatchets have been ground at the site. Six axes had new cutting edges ground, three axes had new cutting edges ground and were subsequently resharpened and 13 axes were resharpened only. All 11 of the hatchets were resharpened only. It is estimated that approximately 72 hours of grinding area represented by the grooves and that this has happened over multiple visits to the sites (refer to **Table 5.11**).

Table 5.11 - Morphology of Grooves in #38-4-1007 - Palmers Creek 1

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
20	5	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
25	9	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
29	10	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
30	7.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
29	8	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	1
35	8	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
23	7	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
34	9	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	1
30	8.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
24	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
30	7.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
33	9	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe – new cutting edge	3
27	8	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
20	6	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
25	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1



PLATE 22
Palmers Creek Grinding Grooves 1



PLATE 23
Palmers Creek Grinding Grooves 1

Table 5.11 - Morphology of Grooves in #38-4-1007 - Palmers Creek 1 (cont)

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
35	8	1.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge	3
17	4	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
32	9	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
30	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
29	13	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
30	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
32	8	2	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
24	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
27	9	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
35	9	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
31	10	1.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge	3
28	8	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	1
26	8	1.5	Elliptical shaped groove 'U' shaped in cross section	Axe - new cutting edge	3
21	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	2
28	8.5	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	2
30	8	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	1
30	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
24	8	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpening	1
30	8	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - new cutting edge	3
Total 22 axes new edges ground and resharpening, 12 hatchets all resharpened only					71

There are at least nine different seating positions at this site, and it would have been possible for eight individuals to grind simultaneously. Based on the differential preservation of grinding grooves at this site, however, it is assessed that multiple visits are represented.

This site had the second highest number of grinding grooves recorded within the proposed continued underground mining area and the third highest total hours of grinding predicted to produce the grooves.

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain and the disturbance caused by prior tree clearance.

5.3.2.11 Palmers Creek Grinding Grooves 2

This site is located on a very large sandstone bench in an upper tributary of Palmers Creek on the south-easterly fall of the Sugarloaf Range (refer to **Figure 5.4**). The bench is approximately 40 metres long and 12 to 20 metres wide. The south-eastern edge of the platform drops by approximately 1.5 metres to create a waterfall to the creekbed below (refer to **Plate 24**). The site has 10 grooves. Eight grooves are located almost sub-parallel to each other, in an elongated cluster which extends to the south-east from a small rockpool and into the flow path of the water. There are also two very narrow grooves located approximately 15 metres to the south-west on a slightly higher relief section of the rock platform (refer to **Plate 25**). These grooves are set at an angle to each other in a manner that if they were elongated further they would form an inverted 'V'. The compass bearing of the apex of the inverted 'V' is 158°. The Palmers Creek 1 Grinding Groove site lies at a compass bearing of approximately 158° from this site. The two narrow linear grooves were interpreted by Shane Frost (ADTOAC) as a direction marker.

In cross-section the relief of the rock platform is a very shallow 'U' shape with the lower section of the platform (with the eight grooves) where water would flow during and shortly after moderately heavy rain. The two narrow linear grooves are out of the area of waterflow and therefore not where grinding grooves are normally expected. Thus an interpretation of these as direction markers is assessed as appropriate; though the shape of the grooves suggests they may have been formed by the grinding of fire hardened wooden or bone spear points (one does not negate the other and it is possible that the grooves served two functions, one economic and one social). It is not possible to estimate the length of time required to grind grooves to this depth using a fire hardened or bone spear point as suggested by the shape of the grooves.

Table 5.12 - Morphology of Grooves in Palmers Creek Grinding Grooves 2

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
11	2.5	0.3	Elliptical shaped very shallow groove 'U' shaped in cross section	Axe - resharpening	0.5
19	4	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
12	2.5	0.2	Elliptical shaped very shallow groove Too faint to determine cross-section	Chisel - resharpening	0.25
13	3	0.3	Elliptical shaped shallow groove Too faint to determine cross-section	Chisel - resharpening	0.5
20	7	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet - new cutting edge	3



PLATE 24
Palmers Creek Grinding Grooves 2



PLATE 25
Palmers Creek Grinding Grooves 2

Table 5.12 - Morphology of Grooves in Palmers Creek Grinding Grooves 2 (cont)

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
10*	2.5	0.2	Start and finish of this groove difficult to determine- very faint Too faint to determine cross-section	Chisel - resharpening	0.25
24	6	0.7	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1.25
10*	6	0.7	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1.25
22	1.5#	1.2##	Narrow linear Semi-circular in cross-section	Spear groove /direction marker	unknown
26	3.5#	4.0##	Narrow – linear Semi-circular in cross-section – accentuates an existing natural groove in rock platform	Spear groove /direction marker	unknown
Total 1 axe resharpening, 1 hatchet new cutting edge, 3 hatchet resharpenings, 3 chisel resharpenings, 2 spear point					8+

*Groove is too weathered for the maximum extent to be measured. This measurement is the maximum extant length of the groove.

#maximum width ##maximum depth

Based on experimental data the morphology of the remaining eight grooves suggests that one axe was resharpened, one hatchet had a new cutting edge ground, three hatchets and three chisels were resharpened (refer to **Table 5.12**). An estimate of eight hours grinding is represented by the grooves (please note that the grooves may have been deeper and may have lost depth due to erosion of the sandstone platform).

The spatial location of the grooves means that it would have been possible for several individuals to grind at this site simultaneously. While there is differential weathering present, this is thought to be associated with different weathering processes (i.e. accelerated weathering in the flow path of water and better preservation for grooves which have case hardening at their edges) rather than reflecting a temporal difference in grinding episodes.

This site was also only one of two (both in the Palmers Creek catchment) to have evidence of the grinding of spear points.

There were no surface artefacts located in association with the grooves. It was, however, assessed that the gentle gradient slope to the south-west of the rock platform had the potential to retain subsurface artefacts. It is possible that this area may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets, chisels) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups such as the Worimi (to the north), Wonnarua (to the west) or Darkinjung (to the south). Thus, it is assessed that area of low gradient associated with the grinding grooves are likely to retain PAD.

5.3.2.12 Palmers Creek Grinding Grooves 3

This site is located downstream of Palmers Creek Grinding Groove 2 on the same upper tributary on the south-eastern fall of the Sugarloaf Range (refer to **Figure 5.4**). A total of 19 grooves were located spread across a sandstone bench in the channel of Palmers Creek

(refer to **Plate 26**). One of the grooves is so long (65 centimetres) it most likely represents two grooves that have joined together. The grooves were located in an area where water would flow following moderately heavy or ongoing rain. Potholes on the sandstone bench would have held water to assist with grinding for a short period after flow had halted and a pool at the base of the sandstone bench would also have held water for a short period after flow ceased. A second small outcrop at the base of the bench and adjacent to this pool also has grinding grooves (refer to **Plate 27**). The grooves are in good condition.

Table 5.13 - Morphology of Grooves in Palmers Creek Grinding Grooves 3

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
25	6	0.75	Elliptical shaped very shallow groove 'U' shaped in cross section	Hatchet – resharpener	1.25
20	8	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpener	5
29	7.5	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpener	5
28	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpener	5
32	7	1	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpener	2
30	8	1	Elliptical shaped shallow groove 'U' shaped in cross section	Axe - resharpener	2
34	9	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpener	6
36	7	1.5	Elliptical shaped shallow groove 'U' shaped in cross section	Axe – new cutting edge	3
65	8	2	Elliptical shaped groove 'U' shaped in cross section	Two axes - two – new cutting edge and resharpener	8
40	7	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpener	4
38	6	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpener	4
32	7	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpener	4
24	9	2	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpener	4
30	7.5	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge	3
34	8	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpener	4



PLATE 26
Palmers Creek Grinding Grooves 3



PLATE 27
Palmers Creek Grinding Grooves 3

Table 5.13 - Morphology of Grooves in Palmers Creek Grinding Grooves 3 (cont)

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
27	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
22	3	1.5	Narrow elongated Semi-circular in cross-section	Chisel – new working edge ground	3
19	2	0.5	Narrow elongated and shallow Semi-circular in cross-section	Fire hardened wooden/bone spear point	unknown
18	2	0.7	Narrow, elongated and shallow Semi-circular in cross-section	Fire hardened wooden/bone spear point	unknown
Total 8 axes and 8 hatchets new cutting edges and resharpening and 1 chisel new cutting edge and 2 possible spear points					64.25+

Based on experimental data the morphology of the grooves suggests that seven axes, one hatchet and one chisel had a new cutting edge ground, six of the axes and five hatchets were subsequently resharpened, one additional axe and three hatchets were resharpened only. Two of the grooves may have resulted from the grinding of fire-hardened wooden or bone spear points (refer to **Table 5.13**).

It was not possible to gauge the total number of seating positions but there were at least six.

This site had the fourth highest number of grinding grooves recorded within the proposed continued underground mining area and the fourth highest total hours of grinding predicted to produce the grooves. This site was also only one of two (both in the Palmers Creek catchment) to have evidence of the grinding of spear points.

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD in close proximity to the grooves due to the gradient of the terrain.

5.3.2.13 Diega Creek Grinding Grooves 1

This site consists of two clusters of grinding grooves on an upper tributary of Diega Creek on the eastern fall of the Sugarloaf Range (refer to **Figure 5.4**). The upstream cluster contains 20 mostly elliptical shaped grinding grooves. These grooves are all located on a sandstone bench in the creekbed (refer to **Plates 28a, b and c**). There are at least two differentially weathered sets of grooves within the cluster, the less weathered grooves number 11. Six of these are located parallel to each other to the south of a central pool of standing water, the remaining five are oriented in the opposite direction (north-east/south-west) at the northern side of the same standing pool. That there are at least two different stages of weathering of the grooves in this cluster may indicate that there were at least two different grinding episodes. The position of the grooves suggests that there were up to seven different seating positions used for grinding.

Assuming that the differential weathering represents a temporal difference in grinding at the site it is likely that the fainter, more weathered grooves could have been made by up to five individuals grinding simultaneously. The less weathered grooves could have been produced by two individuals grinding at the same time.

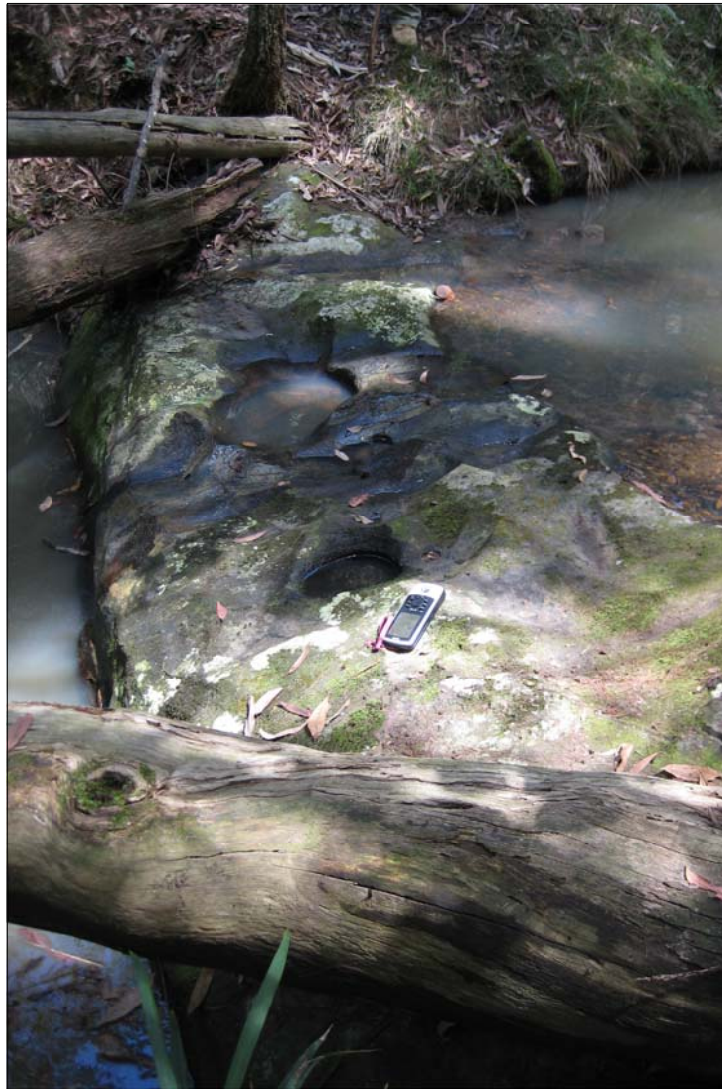


PLATE 28a
Diega Creek Grinding Grooves 1



PLATE 28b
Diega Creek Grinding Grooves 1



PLATE 28c
Diega Creek Grinding Grooves 1

**Table 5.14 - Morphology of Grooves in Diega Creek Grinding Grooves 1
(upstream cluster)**

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
25	7	2	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	4
30	9	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
24	8	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
20	6	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge	3
24	9	2.5	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	5
30	8	4	Elliptical shaped deep groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	8
28	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	5
25	8	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
22	6	2	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	4
29	9.5	3	Elliptical shaped groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	6
30	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	5
19	6	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge	3
29	8	4	Elliptical shaped deep groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	8
28	▪	3	Elliptical shaped groove 'U' shaped in cross section	unknown	6
24	7	3.5	Elliptical shaped deep groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	7
30	7	2.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge and resharpening	5
15	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1

**Table 5.14 - Morphology of Grooves in Diega Creek Grinding Grooves 1
(upstream cluster) (cont)**

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
19	10	4	Oval shaped deep groove 'U' shaped in cross section	Axe – new cutting edge and resharpening	8
19	5	1.5	Elliptical shaped groove 'U' shaped in cross section	Hatchet – new cutting edge	3
16	6	0.5	Elliptical shaped shallow groove 'U' shaped in cross section	Hatchet - resharpening	1
Totals 9 axes and 5 hatchets new edge ground and resharpening, 4 hatchets new edge ground, 1 hatchet resharpened only, 1 unknown					100

▪ The edges of the groove could not be determined and no width measurement was possible.

Based on experimental data the morphology of the grooves suggests that nine axes had a new edge ground and were resharpened on subsequent visits. Four hatchets new edge ground and five hatchets new edge ground and were resharpened on subsequent visits. One hatchet was resharpened only. One groove was not possible to classify due to the lack of a measurement for width. The depths of the grooves suggest around 100 hours of grinding at the site for the upstream grooves (refer to **Table 5.14**).

The second cluster of grooves is located approximately 10 metres downstream of the first on a rock platform three breaks of slope below. It consists of at least seven grooves. It was not possible to obtain accurate counts or measure this last cluster as the grooves were submerged by water from recent rains. The general shape and size of the grooves suggests they were used for grinding both axes and hatchets.

This site had the third highest number of grinding grooves recorded within the proposed continued underground mining area and the second highest total hours of grinding predicted to produce the grooves.

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain.

5.3.2.14 Diega Creek Grinding Groove 2

This site was recorded on 13 March 2009 and consists of at least one and possibly five elliptical grinding grooves. All grooves at this site were very weathered. Three of the grooves were very faint and only millimetres in depth. It was not possible to obtain accurate dimensions for these grooves because of their poor preservation. One of the grooves is badly weathered with very crisp case hardened edges on one side and one end. It is not possible to discern the dimensions of this groove other than these two edges. The final groove is 33 centimetres long by 8 centimetres wide by 0.5 centimetres deep. This groove is 'U' shaped in profile. The location of the five grooves relative to each other suggests that up to three individuals could have ground at this location simultaneously.

The grooves are located in the sandstone creekbed in an upper tributary of Diega Creek and on the eastern fall of the Sugarloaf Range, in an area 1 metre by 0.75 metre (refer to **Plate 29** and **Figure 5.4**). The grooves are clustered in a slight depression where water pools at the edge of an exposed sandstone platform which drops approximately 1.5 metres

to the gravel and boulder filled creekbed below. It is possible, though considered unlikely, that more than the five grooves observed may occur at this site as fallen trees and dense leaf litter were significantly reducing ground surface visibility at the time of recording.

The morphology of the grooves in their current state suggests that one axe was resharpened at the site. The other very shallow depressions most likely represent limited resharpening of stone axes or hatchets; though it should be noted that the grooves may have been much deeper in the past.

Evidence of high water flow within this ephemeral creek such as the gravels and small boulders trapped in the limbs and roots of fallen trees on the sandstone platform suggest that there have been significant sediment/gravel movement through the creek system in the past. Given the recent 50 year storm event experienced in June of 2007 it is possible that the sediments/vegetation/leaf litter/gravels previously obscuring the sandstone platform may have been recently removed re-exposing the grooves.

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain.

5.3.2.15 Diega Creek Grinding Grooves 3

Three grooves were recorded in this site on 13 March 2009. The grooves are located on an exposed 6 metre long by 1.5 metre wide sandstone platform in an ephemeral creek channel of an upper tributary of Diega Creek and on the eastern fall of the Sugarloaf Range (refer to **Figure 5.3**). The creekbed above and below the sandstone platform is sediment covered and the channel edges surrounding the platform are incised by between 20 centimetres and 50 centimetres, indicating that a recent very high flow event (such as the June 2007 storm) may have re-exposed the sandstone platform and the grinding grooves it contains.

The grooves are quite faint and weathered and the southern-most groove is now truncated by a significant 2 centimetres wide crack in the sandstone platform (refer to **Plate 30**). The site is located in a first order stream channel, on a midslope bench approximately 15 metres upstream of the confluence of three first order streams.

Table 5.15 - Morphology of Grooves in Diega Creek Grinding Grooves 3

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
32	8	2	Elliptical groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	4
25	9	1.2	Elliptical shallow groove 'U' shaped in cross section	Axe - resharpening	2.25
33	8	2.5	Elliptical groove 'U' shaped in cross section	Axe - new cutting edge and resharpening	5
Total 2 axes new cutting edge ground and resharpening, 1 axe resharpening					11.25

The morphology of the grooves suggests that two axes had new cutting edges ground at the site and then were resharpened on subsequent visits and one axe was resharpened only. There is only one suitable seating position. The depth of the grooves indicates approximately 11.25 hours of grinding (refer to **Table 5.15**).



PLATE 29
Diega Creek Grinding Grooves 2



PLATE 30
Diega Creek Grinding Grooves 3

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain.

5.3.2.16 Diega Creek Grinding Grooves 4

This site was recorded on 30 March 2009. It consists of three very faint grinding grooves located on two outcrops of sandstone rock platform in the bed of an ephemeral upper tributary of Diega Creek on the eastern fall of the Sugarloaf Range (refer to **Plate 31** and **Figure 5.4**). The two sandstone sections are separated by a small pool that would hold water for a short period after rain. Three seating positions are evident.

Table 5.16 - Morphology of Grooves in Diega Creek Grinding Grooves 4

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
20	5	0.4	Elliptical, shallow groove Very faint	Hatchet - resharpening	0.75
20	8	0.7	Elliptical, shallow groove Very faint	Axe - resharpening	1.5
40	9	1.5	Elliptical, shallow groove U' shaped in cross section	Axe - two - new cutting edge	6
Total 2 axes new cutting edge ground, 1 axe resharpened, 1 hatchet resharpened					8.25

The morphology of the grooves suggests that one axe and one hatchet were resharpened. The third much longer groove may represent the grinding of a new edge on two axes. The depth of the grooves suggests at least 8.25 hours of grinding. While three seating positions were evident the length of the grooves suggests grinding by a single person possibly during a single visit (i.e. the 40 centimetres length equals the joining together of two 20 centimetres length grooves) (refer to **Table 5.16**).

There were no surface artefacts located in association with the site and no associated area thought likely to retain subsurface artefacts/PAD due to the gradient of the terrain.

5.3.2.17 Diega Creek Grinding Grooves 5

Two grinding grooves were recorded on a sandstone bench outcropping in an ephemeral upper tributary of Diega Creek on the eastern fall of the Sugarloaf Range (refer to **Plate 32** and **Figure 5.4**). The grooves are located within proximity of a small waterhole that would have held water for a short period after rain.

The morphology of the grooves suggest that one was created by grinding a new cutting edge on a hatchet and one represents resharpening of a cutting edge on a hatchet. Two seating positions are possible (refer to **Table 5.17**).



PLATE 31
Diega Creek Grinding Grooves 4



PLATE 32
Diega Creek Grinding Grooves 5

Table 5.17 - Morphology of Grooves in Diega Creek Grinding Grooves 5

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
27	6	1	Elliptical shallow groove both ends are quite pointed ('v' shaped) compared to other grooves recorded in the area	Hatchet - resharpening	2
33	6.5	2	Elliptical groove both ends are quite pointed ('v' shaped) compared to other grooves recorded in the area	Hatchet - new cutting edge and resharpening	4
Total 1 hatchet new cutting edge and resharpening 1 hatchet resharpening					6

The shape of the grooves indicates that the hatchets being ground had a slightly less rounded/more pointed cutting edge circumference than those represented by the majority of the other grooves recorded during the survey. It is therefore highly likely that the grooves were ground by one individual and that they may represent a single hatchet which over time has decreased slightly in width due to resharpening. Based on this scenario the grooves most likely represent three visits to the site by a single person. The grooves are in fair condition.

There were no surface artefacts located in association with this site and the general gradient of the area of this site suggests that subsurface artefacts or PAD would be unlikely.

5.3.2.18 Diega Creek Grinding Grooves 6

This site consists of two very faint grinding grooves located at the edge of a 4 to 5 metre waterfall in an ephemeral upper tributary of Diega Creek to the north of Aube's Ridge Road (refer to **Plate 33**) on the eastern fall of the Sugarloaf Range (refer to **Figure 5.4**). The creekbed below changes dramatically from sandstone bedrock to conglomerate pebbles and sandy sediment at this point and thus becomes unsuitable for grinding.

Based on experimental data the morphology of the grooves suggests that they were used to resharpen cutting edges on two hatchets. Approximate time taken to produce the grooves is around 2.25 hours and two seating positions were possible. Only one visit is suggested (refer to **Table 5.18**).

Table 5.18 - Morphology of Grooves in Diega Creek Grinding Grooves 6

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
29	6	0.7	Shallow groove Very faint	Hatchet - resharpening	1.25
26	5.5	1	Shallow groove Very faint	Hatchet - resharpening	1
Total 2 hatchets resharpened only					2.25

There were no surface artefacts located in association with this site and the general gradient of the area of this site suggests that subsurface artefacts or PAD would be unlikely.

5.3.2.19 Cockle Creek Grinding Groove 1

This site consists of one definite elliptical groove in the sandstone bed of an ephemeral upper tributary of Cockle Creek at the edge of a waterfall which dropped steeply 4 to 5 metres to the slope below (refer to **Plate 34** and **Figure 5.4**). The site is on the eastern fall of the Sugarloaf Range. The groove is 32 centimetres long by 6 centimetres wide and 2.5 centimetres deep. It is estimated that the groove represents approximately 5 hours of grinding time.

A second very faint groove may also be at this site, however, it was not possible to positively identify this was the case and not possible to obtain measurements for this very faint depression. Approximately 5 metres south-south-west of the groove is a shelter which has a sandy floor. The floor area of the shelter was relatively small (4 to 5 m²) and it had a maximum height of only 80 centimetres (refer to **Plate 35**). No archaeological evidence was found at the shelter, though it was noted by registered Aboriginal stakeholders at the time that the shelter would have been large enough for one to two individuals to use as refuge in a storm. The rockshelter was not recorded as part of the Cockle Creek Grinding Grooves 1 site, it was, however, recorded as a landscape feature of Aboriginal cultural value (refer to Rockshelter 10 on **Figure 5.2**). ADTOAC (Shane Frost 4 pers. comm. June 2010) wishes it to be stressed that he assesses that the rockshelter is a site despite it not having any visible archaeological evidence at the time of the survey.

The morphology of the groove suggests that it was used to grind a new cutting edge on a hatchet and a subsequent resharpening episode.

There were no surface artefacts located in association with this site and the general gradient of the area of this site suggests that subsurface artefacts or PAD would be unlikely.

5.3.2.20 Cockle Creek Grinding Grooves 2

This site is located outside the proposed continued underground mining area. It consists of two faint grooves recorded in the sandstone creekbed of an upper tributary of Cockle Creek on the eastern fall of the Sugarloaf Range (refer to **Plate 36** and **Figure 5.4**). The grooves are located seven to ten metres from the edge of a waterfall that flows over a shear drop 12 to 15 metres in height.

Based on experimental data the morphology of the grooves suggests that they were used to resharpen cutting edges on two hatchets. Approximate time taken to produce the grooves is around 1.25 hours and two seating positions were possible. Only a single visit is indicated (refer to **Table 5.19**).

Table 5.19 - Morphology of Grooves in Cockle Creek Grinding Grooves 2

Length	Width	Depth	Morphology	Type	Approximate Time (hrs)
26	6	0.3	Elliptical shallow groove Very faint	Hatchet - resharpening	0.5
24	7.2	0.4	Elliptical shallow groove Very faint	Hatchet - resharpening	0.75
Total 2 hatchets resharpened only					1.25

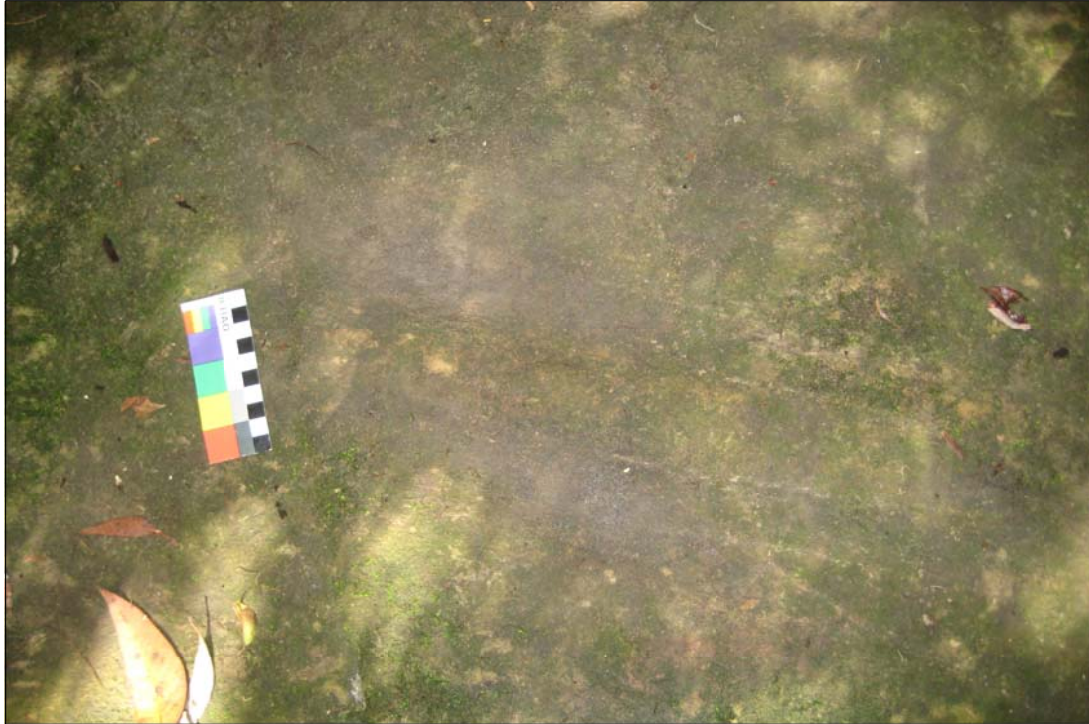


PLATE 33
Diega Creek Grinding Grooves 6



PLATE 34
Cockle Creek Grinding Groove 1



PLATE 35
Small rockshelter near Cockle Creek Grinding Groove 1



PLATE 36
Cockle Creek Grinding Groove 2

There were no surface artefacts located in association with this site and the general gradient of the area of this site suggests that subsurface artefacts or PAD would be unlikely.

5.3.2.21 Summary of Grinding Grooves

A total of 19 grinding groove sites are known to occur within the proposed continued underground mining area, with one new grinding groove site recorded during the survey that was located outside and to the north of the proposed continued underground mining area boundary (Cockle Creek Grinding Grooves 2). While it was not possible to obtain counts of all grinding grooves present at some sites due to inundation or record the dimensions of all grinding grooves at some sites (due to inundation or weathering) a great deal of information in relation to what Aboriginal people were doing at the sites can be gleaned from an analysis of the grinding grooves and their location within the landscape (refer to **Figures 5.3** and **5.4**).

Table 5.20 summarises the information for newly recorded (16) and previously recorded (3) grinding groove sites located within the proposed continued underground mining area (total 19). For comparative purposes also included is the information from the newly recorded site to the north of the proposed continued underground mining area (Cockle Creek Grinding Grooves 2).

From the table it can be observed that the number of grinding grooves recorded in the sites varied from 1 to 40. The morphology (shape and dimensions) of the grooves also indicate that the activities undertaken at the sites was varied with some grooves having dimensions that (based on experimental data) are assessed as having resulted from the grinding of new cutting edges on axes, hatchets, chisels and fire hardened wooden spear points or bone points and the resharpening of edges on axes, hatchets and chisels. One bowl-like groove was assessed as having possibly resulted from food/ochre preparation.

Preservation of the grinding grooves also varied with some sites having poor preservation and some good preservation. Preservation of the grooves within some sites also varied from poor to good suggesting more than one episode of grinding. The resharpening of some implements on numerous occasions is also suggested by the depth of many of the grooves, supporting ongoing use of some sites by the same persons.

The landscape context of the grinding groove sites was fairly consistent with all sites located within creek channels on sandstone benches or in sandstone outcropping in the bed of the creeks. All of the grinding grooves were located in areas where water would have been available for short periods of time after good falls of rain as was experienced during the survey period. Some of the grooves were associated with potholes which would have held water for a period of time after moderately heavy/prolonged rain. No evidence was observed of the potholes being ground out to make them larger as has been recorded in other parts of the Sugarloaf Range (ALALC 2003). It was, however, noted that many of the potholes had been infilled with sediment and it is possible that evidence of these being ground out is hidden by this sediment.

One grinding groove site (#38-4-0462) was associated with a small rockshelter that had a single artefact but no PAD and five sites were assessed as having the possibility of having artefacts in a subsurface context in the adjoining slope landform. These areas were assessed as PAD as it is assessed as possible that adjacent areas of low gradient may have subsurface artefacts associated with the grinding process (e.g. flakes removed from axes, hatchets) that may by their petrological and/or geochemical analysis suggest social interactions between the Awabakal and surrounding tribal groups such as the Worimi (to the

north), Wonnarua (to the west) or Darkinjung (to the south-west) and Kurring-gai (to the south).

An additional grinding groove site (Cockle Creek Grinding Grooves 1) was located in proximity to a rockshelter, however, the rockshelter did not have any visible evidence of use by Aboriginal people. Thus it was not recorded as part of the site during the survey. ADTOAC (Shane Frost pers. com. 4 June 2010), however, would like it noted that he feels the rockshelter was related to the grinding groove site.

A minimum of 647.75 hours of grinding are estimated for the formation of the grooves.

Table 5.20 - Summary of Grinding Groove Sites

Site Name	Context	# Grooves	Type of Grooves	Approximate Time for Grinding (Hours)	Visits M=multiple S=single	Preservation	Associated Surface Artefacts	Associated Subsurface Artefacts/PAD
Bangalow Creek GG1	sandstone bench – upper creek catchment	4	axe, hatchet	15	M	good	0	Subsurface possible/PAD likely
Bangalow Creek GG2	sandstone bench – upper creek catchment	10	axe	53	M	poor to good	0	Subsurface possible/PAD likely
Bangalow Creek GG3	sandstone bench – upper creek catchment	5	axe, hatchet	24.5	M	poor to good	0	Subsurface possible/PAD likely
Bangalow Creek GG4	sandstone bed of creek – upper creek catchment	2	hatchet/food or ochre preparation	2+	M	fair	0	N/A
Bangalow Creek GG5	sandstone bed of creek – upper creek catchment	40	axe, hatchet	198	M	poor to good	0	Subsurface possible/PAD likely
Bangalow Creek GG6	sandstone bed of creek – upper creek catchment	1	hatchet	3	S	good	0	N/A
Bangalow Creek GG7	sandstone bed of creek – upper creek catchment	4	axe, hatchet	18	M	good	0	N/A
#38-4-0461 Bangalow Creek	sandstone bed of creek – upper creek catchment	4	axe, hatchet	12+	M	poor to good	0	N/A
#38-4-0462 Grinding Grooves and Associated Rockshelter Bangalow Creek	sandstone bed of creek – upper creek catchment – associated with small waterfall	16	axe, hatchet	39	M	fair to good	1 in associated rockshelter	N/A
#38-4-1007 (Palmer's Creek 1)	sandstone bed of creek – upper creek catchment	34	axe, hatchet	71	M	good	0	N/A

Table 5.20 - Summary of Grinding Groove Sites (cont)

Site Name	Context	# Grooves	Type of Grooves	Approximate Time for Grinding (Hours)	Visits M=multiple S=single	Preservation	Associated Surface Artefacts	Associated Subsurface Artefacts/PAD
Palmers Creek Grinding Groove 2	sandstone bench – upper creek catchment – associated with small waterfall	10	axe, hatchet, chisel spear point and/or direction marker	8	M	fair to good	0	Subsurface possible/PAD likely
Palmers Creek Grinding Groove 3	sandstone bench – upper creek catchment	19	axe, hatchet, chisel, spear point	64.25	M	good	0	N/A
Diega Creek Grinding Groove 1	sandstone bench – upper creek catchment	27+	axe, hatchet	100+	M	fair to good	0	N/A
Diega Creek Grinding Groove 2	sandstone bed of creek – upper creek catchment	5	axe	6+	M	fair to good	0	N/A
Diega Creek Grinding Groove 3	sandstone platform in creek – upper creek catchment	3	axe	11.25	M	poor	0	N/A
Diega Creek Grinding Groove 4	sandstone platform in creek – upper creek catchment	3	axe, hatchet	8.25	S	poor	0	N/A
Diega Creek Grinding Groove 5	sandstone bench in creek – upper creek catchment	2	hatchet	6	M	fair	0	N/A
Diega Creek Grinding Groove 6	sandstone bed of creek near waterfall – upper creek catchment	2	hatchet	2.25	S	poor	0	N/A
Cockle Creek Grinding Groove 1	sandstone bed of creek near waterfall – upper creek catchment	1+	hatchet	5	M	fair	0	N/A

Table 5.20 - Summary of Grinding Groove Sites (cont)

Site Name	Context	# Grooves	Type of Grooves	Approximate Time for Grinding (Hours)	Visits M=multiple S=single	Preservation	Associated Surface Artefacts	Associated Subsurface Artefacts/PAD
Cockle Creek Grinding Groove 2#	sandstone bed of creek near waterfall – upper creek catchment	2	hatchet	1.25	S	poor	0	N/A
Total = 20 sites	All sandstone benches, platforms, creekbeds in upper catchments of creeklines	194+	axes, hatchets, chisel, fire hardened wooden/bone spear points and/or direction markers	647.75+hours Minimum time estimated for grooves to be produced	16 sites multiple visits 4 sites single visit	Good = 5 Fair = 4 Poor = 4 Poor to good = 4 Fair to good = 3	1	N/A = 15 PAD = 5

+not all grooves could be recorded due to inundation or weathering

#new site outside of project boundary

Table 5.21 indicates that the evidence recorded in the Bangalow Creek, Palmers Creek and Diega Creek catchments reflects a wider number of activities and hours spent within the sites/catchments when compared with Cockle Creek sites/catchment (n.b. this relates only to the sites within the proposed continued underground mining area). In addition, the only grinding groove site to have surface artefactual material was in the Bangalow Creek (#38-4-0462 - 1 quartzite core) catchment and only grinding groove sites in the Bangalow Creek catchment (Bangalow Creek Grinding Grooves 1, 2, 3 and 5) and the Palmers Creek catchment (Palmers Creek Grinding Grooves 2) were assessed as having the potential for subsurface artefacts and PAD within the topsoil deposits of the associated slopes of low gradient. The remaining sites were assessed as unlikely to have associated subsurface artefacts/PAD due to the steepness of the gradient of the associated slopes which would not lend themselves to camping.

The assessed potential for the slopes adjoining some of the grinding groove sites to have artefacts in a subsurface/PAD context, increases their archaeological research potential as it adds another avenue for the investigation of the Aboriginal use of the area and its resources. Of particular importance is that during the initial grinding of an axe it is often necessary to flake away more of the prepared cutting edge in order to allow grinding to proceed efficiently. In areas where this happens adjacent to the grinding grooves it has been possible to identify the raw material used in axe manufacture and through further petrological and/or geochemical analysis, the source of that raw material. This information greatly increases the knowledge of Aboriginal movement throughout the landscape and can be used to identify social interactions such as trade and exchange. In terms of the grinding groove sites recorded within the proposed continued underground mining area. Therefore, it is assessed that the Bangalow Creek Grinding Grooves Sites 1, 2 3 and 5 and the Palmers Creek Grinding Groove 2 site have archaeological research potential.

More broadly the results indicate that there were nine grinding groove sites and 82+ grooves recorded on the western fall of the Sugarloaf Range, eight grinding groove sites and 45+ grooves recorded on the eastern fall of the Sugarloaf Range and three grinding groove sites and 63+ grooves recorded on the south-eastern fall of the Sugarloaf Range. Distribution of the grinding groove sites is shown on **Figure 5.3** and **5.4**. The distribution of grinding groove sites within the proposed continued underground mining area is similar to that noted for the previously recorded grinding groove sites discussed in **Section 3.0 Part C** and shown on **Figure 3.4**.

From the **Figure 3.5** and **Table 5.21** it can be noted that all of the sites are in the upper catchment of the creeklines, The four sites with the highest groove numbers and the predicted highest number of hours spent in grinding (Bangalow Creek Grinding Grooves 5, Diega Creek Grinding Grooves 1, Palmers Creek 1 (#38-4-1007) and Palmers Creek Grinding Grooves 3) are all in the uppermost reach of the catchment of their respective creeklines. The grinding groove sites with the greatest diversity of groove types are also in the upper reaches of the Palmers Creek catchment (Palmers Creek Grinding Grooves 2 and Palmers Creek Grinding Grooves 3).

Only four of the grinding groove sites had evidence that suggested only one site visit to grind stone implements (Bangalow Creek Grinding Grooves 6, Diega Creek Grinding Grooves 4, Diega Creek Grinding Grooves 6 and Cockle Creek Grinding Groove 1). The remaining 16 sites exhibited evidence for multiple site visitations.

Finally, due to the majority of the proposed continued underground mining area being on the eastern fall of the Sugarloaf Range the survey has not been able to indicate if the lack of grinding groove sites on the western fall below the very upper catchment of the creeklines is real or a result of lack of survey in this area.

Table 5.21 - Summary of Grinding Groove Sites/Creek Catchment

Catchment	# Grinding Groove Sites	# Grooves	Type of Grooves	Approximate Time for Grinding (Hours)	Visits M=multiple S=single	Surface Artefacts	Associated Subsurface Artefacts/PAD
Bangalow Creek Western fall of the Sugarloaf Range	9	86+	axe, hatchet, food or ochre preparation	364.5+	M = 9	1	4 out of 9 sites potential for subsurface artefacts and PAD
Palmers Creek South-eastern fall of the Sugarloaf Range	3	63	axe, hatchet, chisel spear point and/or direction marker	143.25	M = 3	0	1 out of 3 sites potential for subsurface artefacts and PAD
Diega Creek Eastern fall of the Sugarloaf Range	6	42+	axe, hatchet	133.75+	M = 4 S = 2	0	0 out of 6 sites potential for subsurface artefacts or PAD
Cockle Creek# Eastern fall of the Cockle Creek Range	2	3+	hatchet	6.25+	M = 1 S = 1	0	0 out of 2 sites potential for subsurface artefacts or PAD

+not all grooves could be recorded due to inundation or weathering

#includes one new site outside of project boundary

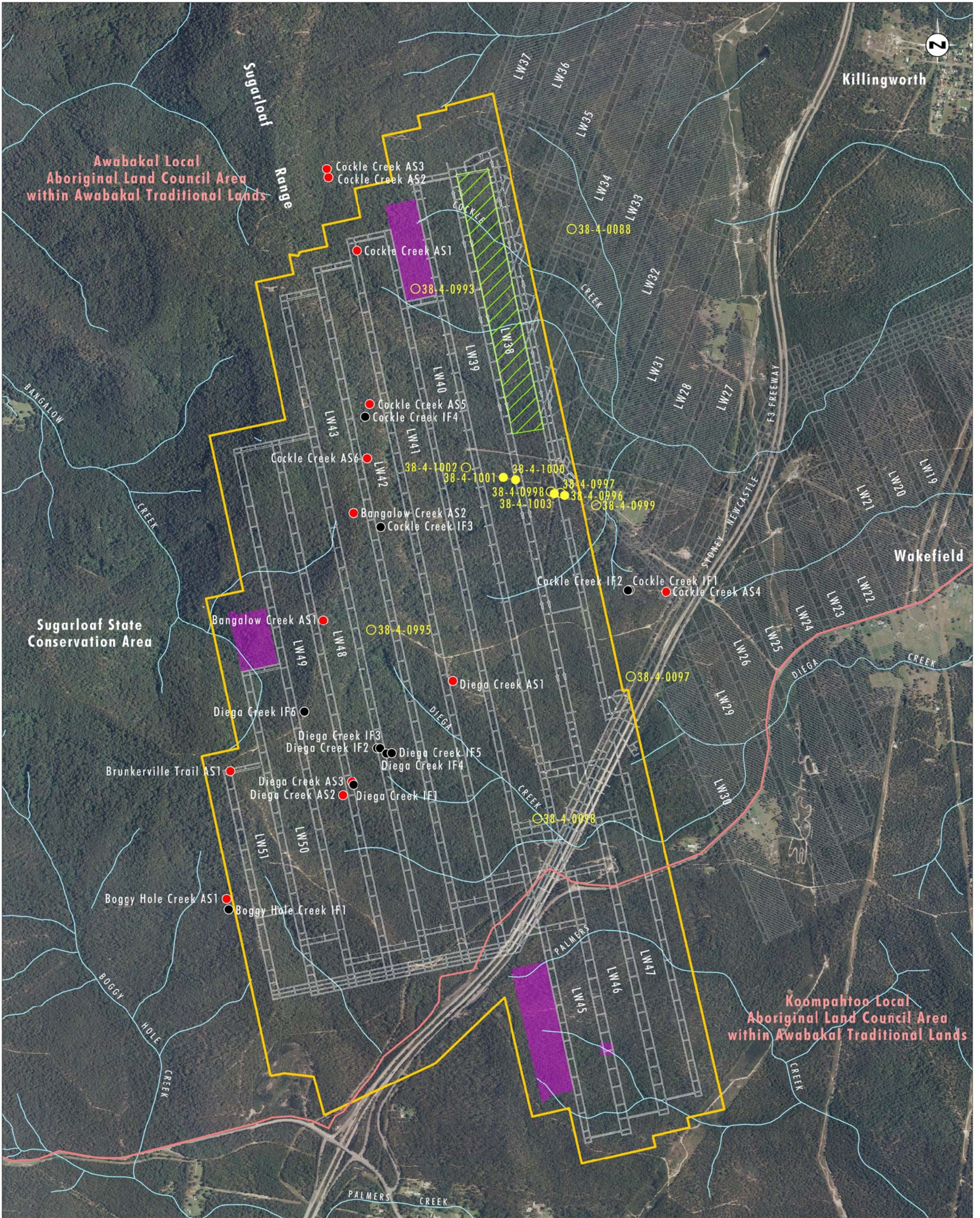
The Aboriginal cultural significance of the grinding groove sites will be discussed in **Section 6.1**. The data from the recording and analysis of the grinding groove sites will be used to assess their archaeological significance (refer to **Section 6.2**).

5.3.3 Sites Containing Stone Artefacts

A total of 24 previously unknown sites containing stone artefacts (13 artefact scatters and 11 isolated finds) were recorded during the survey. The sites were recorded in areas where there was enhanced ground surface visibility such as on 4WD and motorcycle tracks (refer to **Figure 5.5**). The contents of all stone artefact sites which occur within and in proximity to the proposed continued underground mining area are described in **Table 5.22**. Within **Table 5.22** the sites recorded in *italics* are those sites that were recorded that were located just outside the proposed continued underground mining area boundaries. Four of these sites were located during movements between transects. The 12 sites listed with DECCW AHIMS site numbers are the previously known sites within the proposed continued underground mining area or in its proximity (seven artefact scatters and five isolated finds). Sites Western Domain 1 to 4 and 9 were previously salvaged under Section 87 Aboriginal Heritage Impact Permit #1098480.

Table 5.22 indicates that of the total 36 sites:

- the vast majority of the artefacts located within the proposed continued underground mining area and in its proximity were manufactured from Nobbys tuff, or a darker grey slightly coarser tuff or silcrete, though artefacts made from other raw materials such as quartz, petrified wood, quartzite, mudstone and an unidentified volcanic material were also recorded;
- all of the stone artefact scatter and isolated find sites within the proposed continued underground mining area and in its proximity have been recorded in a disturbed context (caused by earthworks, road construction, motor bike trails and in a more general sense a history of logging followed by erosion). Impact from logging practices and track use has lead to very high instances of artefact breakage. Around two-thirds of the artefacts recorded were broken flakes;
- most artefact scatters contain small numbers of artefacts (<15), however, relatively larger artefact scatters do occur in the proposed continued underground mining area (scatters of 18 and 46 artefacts) and surrounds (a scatter of 39) – all of these are in the Diega Creek catchment area;
- there were high instances of heat affects, such as heat shatter, colour change, charring and pot lids, recorded in the artefact assemblage indicating that the artefacts have been exposed to uncontrolled heat from bushfires since they have been discarded;
- only two sites had retouched flakes (Diega Creek AS3 and Western Domain 8 [in the Cockle Creek catchment]);
- all new artefact scatter and isolated find sites were located on areas of relatively gentle gradient on spur and ridge crests, while a number of the previously recorded sites were associated with watercourses/a wet soak; and
- there was a pattern of recurring artefact location on crests/benches of gentle gradient that were located between the upper tributary watercourses, rather than beside the watercourses (it should be noted that there are multiple minor first and second order tributaries draining the proposed continued underground mining area and it is generally not possible to be more than a few hundred metres from a minor watercourse).



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- Artefact Scatter
- Isolated Find

- Previously Recorded Sites
- Artefact Scatter
 - Isolated Find

FIGURE 5.5

New and Previously Recorded
Sites with Stone Artefacts

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Bangalow Creek AS1	3	1 tuff broken flake, 1 siltstone broken flake, 1 siltstone core	Sugarloaf Range Ridge	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefacts were located at the edge of the Sugarloaf Range Road at the junction of another vehicle track off to a western spur - high breakage from vehicular impact.
Bangalow Creek AS2	6	5 tuff broken flakes, 2 silcrete broken flakes and 1 shell	Sugarloaf Range Ridge	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefacts found on Sugarloaf Range Road, high breakage from vehicular impact. The shell is one valve of the bivalve known as a dog cockle (<i>Glycymeris grayana</i>). The dog cockle is not a species commonly found in shell midden sites as it is very tough and not thought suitable for human consumption. The shell is small and immature and if brought to the area by Aboriginal people was most likely to have been carried to the area for its ornamental value. The shell is in fair condition but has much of its colouration.
Boggy Hole Creek AS1	12	7 tuff broken flakes, 1 tuff core, 2 tuff flakes, 2 quartz broken flakes	Outside the proposed continued underground mining area.	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefacts are scattered over an area 15 metres by 30 metres, at the intersection of two graded vehicle tracks on a major spur crest.
Boggy Hole Creek IF1	1	quartz broken flake	Outside the proposed continued underground mining area.	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Located on a graded vehicle track on a major spur crest

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Cockle Creek AS1	14	5 tuff flakes, 1 silcrete pot lid, 1 tuff core, 1 silcrete flaked piece, 5 tuff broken flakes, 1 silcrete flake	Secondary Spur	It is possible that a low to moderate density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Silcrete has colour change, four of the tuff artefacts are charred. Artefacts found over a 40 metre by 10 metre area on several motorcycle tracks
Cockle Creek AS2	13	9 tuff broken flakes, 2 silcrete broken flakes, 2 quartz flakes	Outside the proposed continued underground mining area.	<i>Due to erosion and soil loss in this area it is not assessed as likely that artefacts would remain in a subsurface context and PAD is not possible.</i>	<i>Artefacts located on a 4WD vehicle track. Artefacts recorded over a 30 metres long section of the track - most concentrated on a knoll. Seven of the tuff artefacts were very charred from burning. Silcrete has colour change from heat.</i>
Cockle Creek AS3	39	2 silcrete flakes, 15 silcrete broken flakes, 17 tuff broken flakes, 4 tuff flakes, 1 quartz flake	Outside the proposed continued underground mining area.	<i>It is possible that a low to moderate density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.</i>	<i>Artefacts located on a 4WD vehicle track. Scatter recorded over a 40 metres long section of vehicle track on a slope. A large proportion of tuff flakes are charred from burning and all the silcrete has colour change.</i>
Cockle Creek AS4	8	6 tuff broken flakes, 1 quartz flake, 1 tuff core	Midslope Bench Outside the proposed continued underground mining area.	<i>It is possible that a low density/low complexity artefact scatter may exist in the bench area away from the graded road in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.</i>	<i>In windrow along the edge of a graded vehicle track where it crosses a bench on the slope.</i>
Cockle Creek AS5	3	silcrete broken flake, tuff core, tuff flake	Midslope Bench	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On previously cleared and overgrown road exposed by motorcycle track.

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Cockle Creek AS6	4	quartz flake, 2 tuff broken flakes, tuff flake	Midslope Bench	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On previously cleared and overgrown road exposed by motorcycle track.
Cockle Creek IF1	1	tuff flake	<i>Outside the proposed continued underground mining area.</i>	<i>It is possible that a low density/low complexity artefact scatter may exist in the bench area away from the graded road in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.</i>	<i>Artefacts found on motorcycle track.</i>
Cockle Creek IF2	1	tuff flake	<i>Outside the proposed continued underground mining area.</i>	<i>It is possible that a low density/low complexity artefact scatter may exist in the bench area away from the motor cycle track in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.</i>	<i>This flake was broken but both conjoinable parts were found together. Artefact found on motorcycle track.</i>
Cockle Creek IF3	1	tuff flake	Midslope Bench	It is possible that a low density/low complexity artefact scatter may exist in the bench area away from the motor cycle track in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On previously cleared and overgrown track exposed by motorcycle track.
Cockle Creek IF4	1	tuff flake	Midslope Bench	It is possible that a low density/low complexity artefact scatter may exist in the bench area away from the motor cycle track in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On previously cleared and overgrown track exposed by motorcycle track.

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Western Domain 1 (#38-4-0996)	1	tuff core	Riparian Zone	Site has been collected under DECCW AHIP #1098480.	Artefact found on a vehicle track which has previously been graded. ✧
Western Domain 2 (#38-4-0997) Cockle Creek	10	7 tuff flakes (some heat shatter), 1 volcanic flake with residues, 1 silcrete flake, 1 silcrete core	Riparian Zone	Site has been collected under DECCW AHIP #1098480.	Artefacts were recorded over area 20 metres long by 2.5 metres wide on a previously graded vehicle track. ✧
Western Domain 3 (#38-4-0998)	5	3 tuff flakes, 1 petrified wood flake, 1 silcrete flake	Riparian Zone	Site has been collected under DECCW AHIP #1098480.	Artefacts found on a vehicle track which runs partially over a dam wall. The artefacts were scattered over a 30 metre by 7 metre area. ✧
Western Domain 4 (#38-4-0999) Cockle Creek	6	5 silcrete flakes and broken flakes, 1 tuff broken flake	Outside the proposed continued underground mining area	Site has been collected under DECCW AHIP #1098480.	Artefact found on a vehicle track which had previously been graded. ✧
Western Domain 5 (#38-4-0993) Cockle Creek	6	4 tuff flakes, 2 silcrete flakes	Secondary Spur	Highly significant Aboriginal cultural site is now outside of project area due to mine plan design changes.	Artefacts located on a midslope bench at the edge of a perched swamp known as the 'Wet Soak'
Western Domain 6 (#38-4-1000) Cockle Creek	1	1 silcrete flake	Simple Slope	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefact found on a vehicle track.
Western Domain 7 (#38-4-1001) Cockle Creek	1	tuff flake	Simple Slope	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefact found on a vehicle track.

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Western Domain 8 (#38-4-1002) Cockle Creek	14	1 silcrete Bondi point, 5 silcrete flakes and broken flakes, 1 silcrete elouera, 2 pieces of tuff heat shatter, 4 tuff flakes and broken flakes	Secondary Spur	It is possible that a low to moderate density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefacts were found at the 'T' intersection of two existing vehicle tracks.
Western Domain 9 (#38-4-1003) Cockle Creek	1	1 heat affected silcrete broken flake	Riparian Zone	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Artefact is located in recently mechanically cleared area next to a fence line. ✧
Brunkerville Trail AS1 Diega Creek	18	9 tuff broken flakes, 1 tuff flake, 1 quartz flake, 1 quartz broken flake, 1 mudstone broken flake, 2 silcrete flakes and 3 silcrete broken flakes	Sugarloaf Ridge	Due to erosion and soil loss in this area it is not assessed as likely that artefacts would remain in a subsurface context and PAD is not possible.	Active erosion at site, no vegetation cover, highly disturbed due to active 4WD use. All silcrete is heat affected (colour change) and there are very high instances of artefact breakage and edge damage.
Diega Creek AS1	15	14 tuff broken flakes, 1 quartz flake	Secondary Spur	It is possible that a low to moderate density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	Five of the tuff broken flakes are heat affected (charring or heat shatter). Artefacts located in a secondary 4WD vehicle track which runs south-west off Aube's Ridge Rd.
Diega Creek AS2	2	1 tuff flake, 1 silcrete flake	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	The tuff flake is elongated (blade like). Heat affects (colour change - silcrete, and charring - tuff) noted. Area previously cleared, disturbed.

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Diega Creek AS3	4	1 silcrete flake, 1 tuff broken flake, 1 quartzite broken flake and 1 tuff retouched flake (Bondi point)	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	The retouched tuff flake and the quartzite broken flake are blade-like and have parallel dorsal scars (indicating prior blade manufacture). Heat affects (colour change – silcrete, and charring - tuff) noted. The retouched tuff flake was unifacially backed from the ventral surface.
Diega Creek IF1	1	tuff broken flake	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On motorcycle track.
Diega Creek IF2	1	tuff broken flake	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On motorcycle track.
Diega Creek IF3	1	silcrete heat shatter	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On motorcycle track.
Diega Creek IF4	1	quartz broken flake	Sugarloaf Range Ridge	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On motorcycle track.

Table 5.22 - Summary of Artefact Scatter and Isolated Find Sites (cont)

Site Name	No. of Artefacts	Artefact Description	Landform Element	Subsurface Artefacts/PAD	Further Comments
Diega Creek IF5	1	tuff core (heat shattered)	Secondary Spur	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On motorcycle track.
Diega Creek IF6	1	tuff flake	Sugarloaf Range Ridge	It is possible that a low density/low complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	On the edge of the Sugarloaf Range Road.
GNW1× – additional information recorded AS Diega Creek (#38-4-0995)	46	7 tuff broken flakes, 1 tuff flake, 1 quartz flake, 1 mudstone broken flake, 29 silcrete broken flakes, 7 silcrete flaked pieces	Major Spur	It is possible that a low to moderate density/low to moderate complexity artefact scatter may exist in this area in a subsurface context. Due to prior disturbance the soil profile of the area is unlikely to retain integrity and thus was not recorded as PAD.	This site was recorded in 2005 as 2 tuff flaked pieces at the edge of Archery Rd. Heat effects present (colour change in silcrete, some of the tuff is charred). One of the silcrete broken flakes has greasy lustre. The site is located on a graded road. It is highly likely that the artefact have eroded from both the road and the road cutting.
#38-4-0098 IF Diega Creek	1	'1 flake found in the roadway' (J C Lough and Associates 1981:4 Appendix 1).	<i>Outside the proposed continued underground mining area</i>	unknown	Attempts to relocate this site during the Western Domain survey in 2006 were unsuccessful. ✧
#38-4-0097 AS Diega Creek	2	'2 pieces of stone found on surface' (J C Lough and Associates 1981:4 Appendix 1).	Secondary Spur	unknown	Attempts to relocate this site during the Western Domain survey in 2006 were unsuccessful.
			Total 36 sites	Total 246 artefacts	

× In addition to the stone artefact sites recorded during the survey additional site information was recorded at #38-4-0995 (GNW1). Originally recorded as two broken artefacts in 2005.

✧ Sites were subject to Surface Collection as per the conditions of s87 Permit #1098480. Refer to **Section 3.0 Part C** for details of artefacts collected.

NB - The italicised entries in the above table are located outside if the proposed continued underground mining area.

Overall, the number of artefacts recorded in the sites was very low when compared with sites recorded along the coast or further inland in association with watercourses. However, they are similar to the numbers of artefacts located within other areas of the Sugarloaf Range (Umwelt 2002, 2003a, 2003b, 2004b, 2006c, 2006e).

The number and types of artefacts and raw materials are also consistent with expectations for the Sugarloaf Range area, where low artefact numbers are the norm and tuff dominates assemblages and retouched artefacts are rare (Umwelt 2002, 2003a, 2003b, 2004b, 2006c, 2006e).

The location of the artefact scatter and isolated find sites on the ridge, spur crests and midslope benches was predicted (refer to **Section 3.4.3**) as these are the areas that afford the easiest travel routes and only areas of a gradient suitable for camping. It could be argued that this result has been biased by the greater ground surface visibility afforded by the graded tracks that run along these landforms; however, an understanding that these tracks follow Aboriginal pathways/travel routes (refer to **Section 3.0 Part A**), suggests that the results are not biased but a real reflection of Aboriginal use of this landscape.

Artefact scatter and isolated find sites were not commonly located in association with the watercourses as predicted in **Section 3.0 Part C**. It is assessed that there are a number of reasons for this result:

- the generally steep gradient of the landforms associated with watercourses in most of the area surveyed which makes them unsuitable for camping;
- as the areas of gentle gradient in most of the area surveyed were generally located on minor spur crests between the creeklines – these areas are much better suited to camping than areas directly adjacent to the creeks; and
- the very poor ground surface visibility associated with the watercourses.

Table 5.23 provides a summary of the artefact scatter and isolated find sites by creek catchment.

Table 5.23 - Summary of Artefact Scatter and Isolated Find Sites/Creek Catchment

Site Name	No. of Sites	No. of Artefacts	Artefact Types	Raw Materials	Subsurface Artefacts/PAD
Bangalow Creek Catchment	2	9	flakes, broken flakes, flaked pieces, cores (+1 core in rockshelter associated with #38-4-0462 grinding groove site)	tuff, silcrete, siltstone, quartzite, shell	Subsurface artefacts likely in most sites, PAD however is highly unlikely.
Boggy Hole Creek Catchment	2	13	flakes, broken flakes, cores	tuff, quartz	Subsurface artefacts likely in both sites, PAD however is highly unlikely.
Cockle Creek Catchment	19	130	flakes, broken flakes, retouched flakes, flaked pieces, cores	tuff, silcrete, quartz, siltstone, quartzite, volcanic, petrified wood	Subsurface artefacts likely in a few sites, PAD however is highly unlikely.

Table 5.23 - Summary of Artefact Scatter and Isolated Find Sites/Creek Catchment (cont)

Site Name	No. of Sites	No. of Artefacts	Artefact Types	Raw Materials	Subsurface Artefacts/PAD
Diega Creek Catchment	13	94	flakes, broken flakes, retouched flakes, flaked pieces, cores	tuff, silcrete, quartz, siltstone,	Subsurface artefacts likely in many sites, PAD however is highly unlikely.
Total	36	246			

The table indicates that despite relatively intense survey, no surface artefacts were located in the Palmers Creek catchment. The table indicates that assemblages recorded in the Cockle Creek catchment and the Diega Creek catchment contained a greater diversity of artefact types and raw material types when compared with the Boggy Hole Creek and Bangalow Creek assemblages (the only retouched artefacts were located in the Cockle Creek and Diega Creek catchments). However, this result may be biased by the limited area of these catchments in the proposed continued underground mining area.

Conversely, the sites in the Boggy Hole Creek and Bangalow Creek catchments were thought likely to have subsurface artefacts in most cases while those in Cockle Creek and Diega Creek were thought less likely to have artefacts in a subsurface context in a number of sites due to high erosion levels. The assessed potential for the landforms adjoining the artefact scatter and isolated find sites to have artefacts in a subsurface context, increases their archaeological research potential as it adds another avenue for the investigation of the Aboriginal use of the area and its resources. None of the sites, however, were thought to retain PAD so that research potential is assessed as limited.

5.3.3.1 Raw Material Sources

The majority of the stone used for artefact manufacture within the sites was Nobbys' tuff and a darker, more porous tuff both of which are available within Awabakal territory. Nobbys tuff from Nobbys Headland and the darker grey tuff from the Hexham Swamp area to the north-east (Kuskie and Kamminga 2000, Umwelt 2001, Umwelt 2002). It should be noted that at the time the artefacts were being discarded in the sites that Nobbys Headland was an island and Aboriginal people would have had to travel by canoe to the island to obtain stone, or alternatively they may have been able to collect the tuff from the beaches to the north of Nobbys (delivered by longshore currents).

Other locally available raw materials observed included quartzite and quartz. Both of these raw materials are available from the local conglomerates of the Sugarloaf Range area. Shane Frost (ADTOAC 4 June 2010) also reports that the basalt artefacts could have been manufactured from locally occurring basalt cobbles and that the silcrete artefacts could have been obtained from the Shortland area and thus within Awabakal territory.

The provenance of the mudstone is more problematic. This raw material is readily available from cobble beds within the Hunter River; however, not within the section of the Hunter River that is currently recognised/mapped as Awabakal territory (Tindale 1974). It is possible, however, that recent (post European) sediment loads in the Hunter River have acted to bury cobble beds that may once have been available to Awabakal people. It is also possible that the stone was obtained from Aboriginal people living further upstream along the Hunter River by trade or exchange, or that the Awabakal had free access further upstream (indicating their territory was more extensive inland than currently mapped), or that the artefacts manufactured from these raw materials were left by visitors to Awabakal territory. The latter

is thought unlikely as most of the artefact scatter sites are dominated by locally available raw materials suggesting discard by Awabakal people.

Silcrete has also been recorded as available in the Beresfield area to the north (Kuskie and Kamminga 2000). In order to gain a greater understanding of the provenance of the raw materials being discarded in the sites, further survey is required to the north, south and west to obtain a greater sample of sites and thus greater insight into questions related to territorial boundaries and visitors from out of Country.

The Aboriginal cultural significance of the artefact scatter and isolated find sites will be discussed in **Section 6.1**. The data from the recording and analysis of the artefact scatter and isolated find sites will be used to assess their archaeological significance (refer to **Section 6.2**).

5.3.4 Cockle Creek Rockshelter with Artefacts and PAD

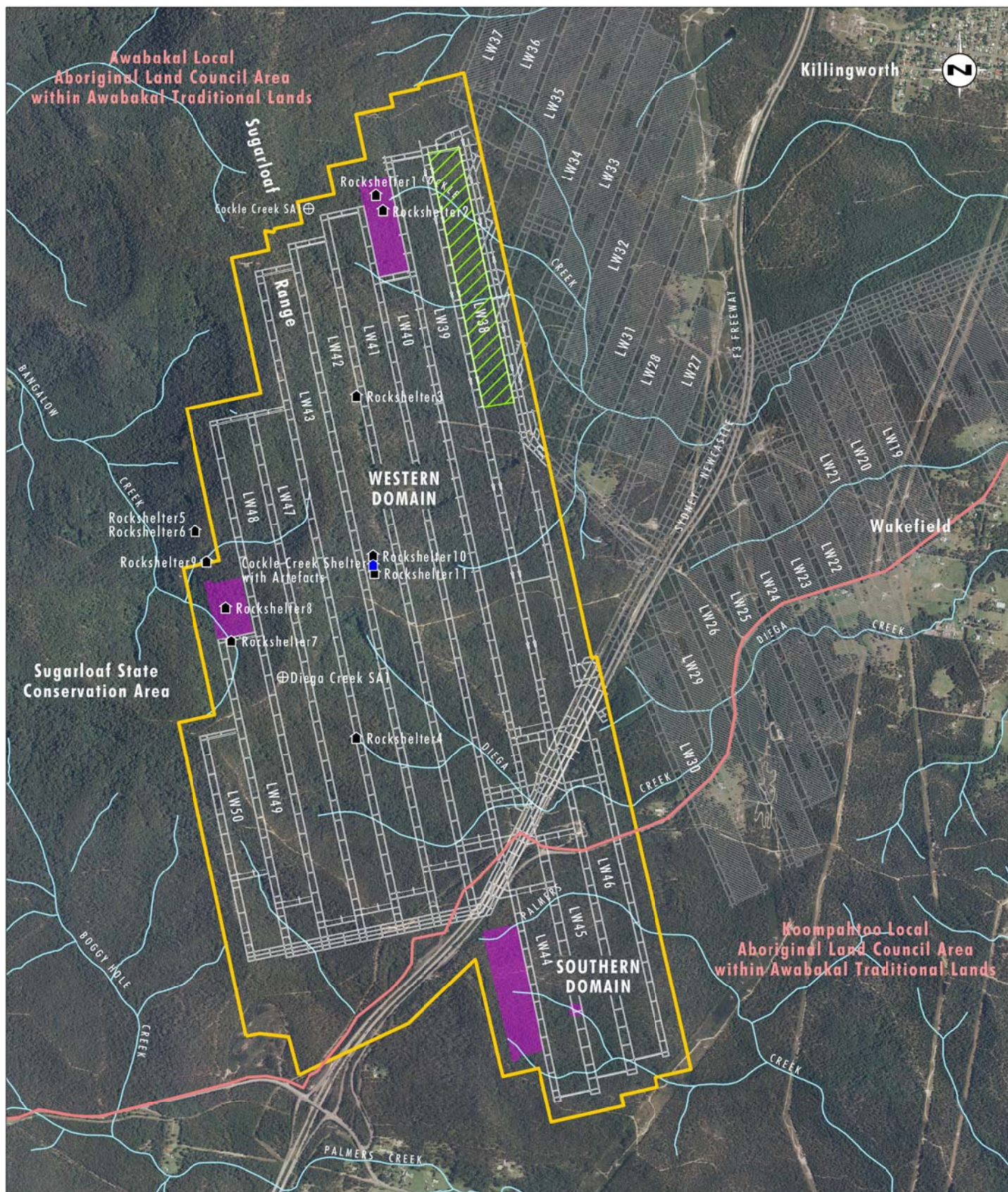
Thirteen rockshelters were inspected during the proposed continued underground mining area field survey. Because of the ubiquitous nature of these features within cliffines and under boulders within and surrounding the proposed continued underground mining area, only rockshelters with archaeological evidence were recorded as sites (the Cockle Creek Rockshelter with Artefacts and PAD and the #38-4-0462 grinding groove site and associated rockshelter). The decision to record only rockshelters that contained physical evidence of Aboriginal use as sites was made to ensure that Aboriginal shelter use was not being overestimated. It is acknowledged that this is an archaeological perspective and that the participating registered Aboriginal stakeholders stressed the cultural importance of the many other rockshelters encountered as they could have been used by Aboriginal people in the past. The importance of the cultural heritage perspective is acknowledged and is discussed by the participating registered Aboriginal stakeholders in **Section 5.2.7**.

The Cockle Creek Rockshelter (refer to **Figure 5.6**) was noted as having two heat affected (crazed) tuff broken flakes within the inner dripline (there was also a piece of bone found but the state of preservation of the bone suggests it is relatively recent – refer to **Plate 37**). The artefacts had been exposed by rainwater dripping from the top of the opening of the shelter onto the floor deposits. Rain splash differentially removes the lighter floor deposits leaving behind heavier objects such as stone artefacts that were once buried in the floor deposits. Thus locating artefacts in the dripline reveals the potential for buried artefacts within the floor deposits. Furthermore, dark grey staining of the deposits, fragmented charcoal and the crazing of the artefacts within the deposits could reflect the use of hearths (fireplaces) within the rockshelter (but could also have resulted from bushfire).

The Cockle Creek Rockshelter is located in a sandstone cliffline beside an ephemeral tributary in the Cockle Creek Catchment. The rockshelter is approximately 5 metres wide, up to 2.7 metres in depth and 1.6 metres in height (refer to **Plate 37**). Most of the floor area is sandy sediment which has a maximum estimated depth of 30 to 40 centimetres. This sandy floor area is assessed as being a PAD. The back of the shelter has a small area of relatively flat floor but the deposit slopes quite steeply 4 to 5° towards the mouth of the shelter. The cliffline then drops away very steeply to the valley below (refer to **Plate 38**).

The roof of the rockshelter exhibits significant cracking and roof failure as a result of this natural cracking is likely, however, it is not possible to say when this may happen, only that it is inevitable.

There are two other rockshelters to the north and south of the same sandstone outcrop, however, they had no visible archaeological material and thus were not recorded as sites. An ephemeral watercourse flows between the Cockle Creek Rockshelter with Artefacts and PAD and the southern rockshelter. The sandstone outcrop continues for approximately 7 metres in



Source: OCAL - Aerial Photograph, Longwell Layout
LPI - Drainage Lines

0 0.5 1.0 1.5 km
1:30 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater
- Rockshelter
- Shelter with Deposit
- Stone Arrangement

FIGURE 5.6

Rockshelters and
Stone Arrangements



PLATE 37
Artefacts located in Cockle Creek Rockshelter



PLATE 38
Cockle Creek Rockshelter with Artefact and PAD

front of these shelters (and across the area of water flow between them) then drops away steeply to the creekline below (refer to **Plate 37**).

Rockshelter sites with PAD, such as the Cockle Creek Rockshelter, have archaeological research potential as it is possible that the floor deposits may contain artefacts that retain stratigraphic and spatial integrity. The possibility of hearths within the deposits also suggests that the deposits could contain evidence of Aboriginal use that could be dated through radiocarbon or thermoluminescence dating. The small number of artefacts located within the dripline and exposed by the deposits spilling out of the rockshelter, suggest that only low numbers of artefacts would be expected.

The Aboriginal cultural significance of the Cockle Creek Rockshelter site will be discussed in **Section 6.1**. The data from the recording and analysis of the Cockle Creek Rockshelter site will be used to assess its archaeological significance (refer to **Section 6.2**).

5.3.5 Stone Arrangements

Two stone arrangements (refer to **Figure 5.6**) were found within the proposed continued underground mining area. While they share common attributes (both are made of coarse sandstone), they are quite different in size and in the landform context in which they occur (please note that photographs of the stone arrangements have not been included in the report at the request of the registered Aboriginal stakeholders).

5.3.5.1 Cockle Creek Stone Arrangement 1

This stone arrangement is located on a narrow mid slope spur, on a high point at the edge of an ephemeral drainage line approximately 3 to 5 metres from the creek channel. One course of stones is standing at the site, though the location of stone surrounding this shows that there was at least one more course of stone on top which has since collapsed. The stone arrangement (excluding the stones which have fallen from the second and possibly third course) is 2 metres wide (north-east/south-west) by 1.55 metres long (north/south). A total of 17 separate stones associated with the arrangement were recorded at the site. All the stones recorded as part of this arrangement were flat on opposite edges (top and bottom of the stones in the standing course) suggesting that the stones may have been specially selected and/or shaped before being arranged into a cairn. No obvious evidence of percussion was visible on the stones, though they are weathered and covered to varying degrees on exposed surfaces in micro-flora (lichens and mosses).

Approximately five metres north of the main stone arrangement there are three stacked stones in a triangular formation. There is a fourth stone which may have been associated with these stacked stones located immediately adjacent to them, to the west. The main stone arrangement and the three stacked stones lay approximately 1.2 metres and 5 metres respectively to the south of what is now a motorcycle track.

5.3.5.2 Diega Creek Stone Arrangement 1

This arrangement consists of three courses of stones; nine on the lowest course; five on the second course and one capstone which can only be placed on the cairn in one direction and has been shaped to fit. The maximum dimensions of the arrangement are 63 centimetres by 61 centimetres and it stands 23 centimetres tall.

Diega Creek Stone Arrangement 1 is found at the edge of the main Sugarloaf Range Ridge at the intersection of a major south-east oriented spur (refer to **Figure 5.6**). This spur would have provided easy access from the Sugarloaf Range to the foothills below.

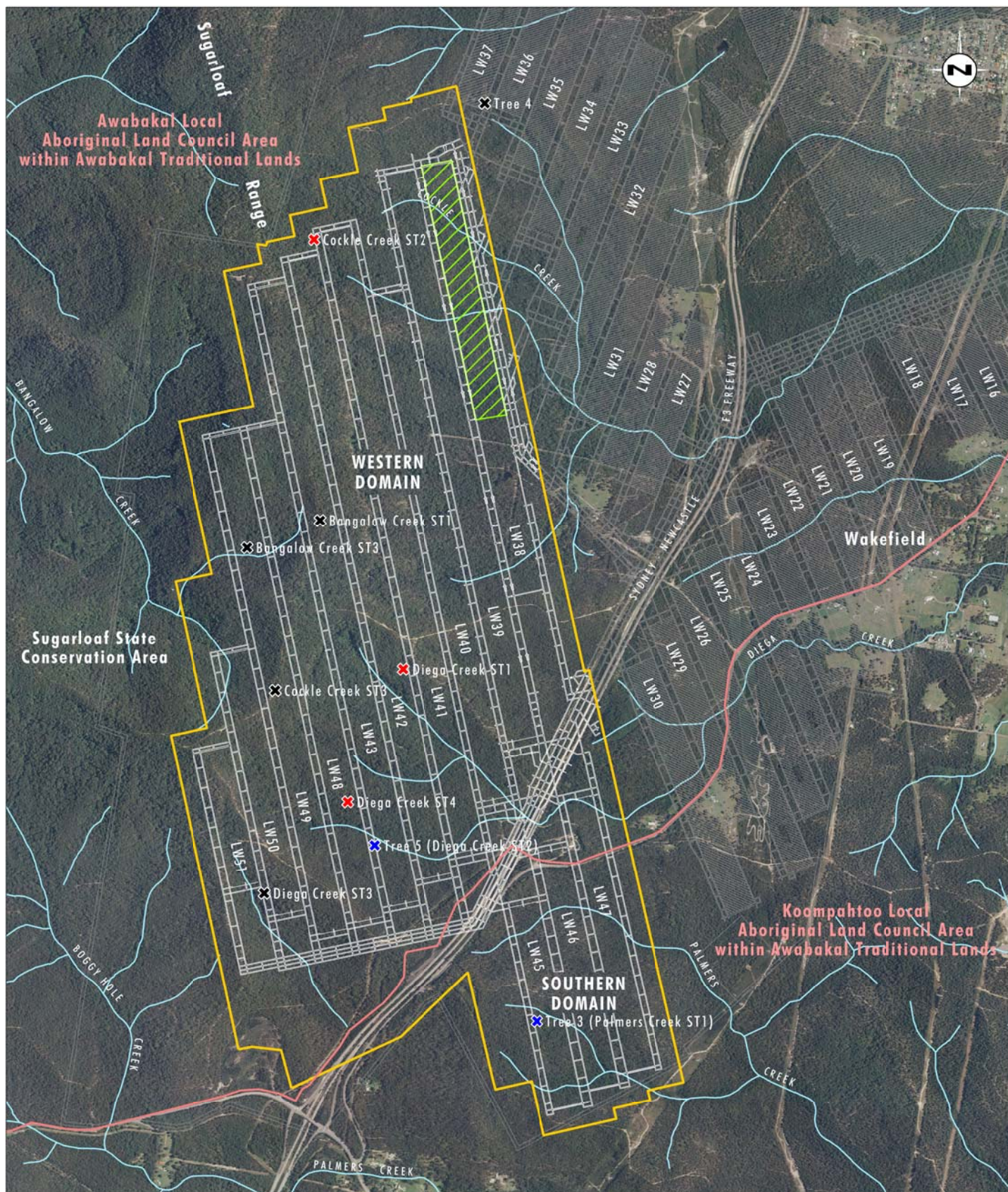
The Aboriginal cultural significance of the Stone Arrangement sites will be discussed in **Section 6.1**. Stone arrangements are relatively rare site types and this rarity will be taken into account within the archaeological significance assessment (refer to **Section 6.2**).

5.3.6 Scarred Trees

During the survey, 11 scarred trees were noted by the fieldwork team as requiring arboricultural assessment to determine likely scar age and likely causation (i.e. Aboriginal, historic or natural). **Table 5.24** summarises key information for each tree, and lists the outcome of the arboricultural assessment undertaken by Urban Tree Management, which is attached in **Appendix F** (UTM 2009). A full description of each tree is provided in **Appendix F** which also provides information on the scars, location of the trees, land use/disturbances, and tree/scar condition. The scarred tree locations are shown on **Figure 5.7**. The scarred trees identified as Aboriginal in likely causation are shown in **bold** type.

Table 5.24 - Scarred Trees Subject to Arboricultural Assessment within the Proposed Continued Underground Mining Area

Site/Tree	Species	Likely Age of Tree (years)	Likely Age of Scar (years)	Likely Scar Causation	Condition
Bangalow Creek ST Historic 1	<i>Eucalyptus umbra?</i> Broad-leaved White Mahogany	150 - <200	>75 - <100	Surveyor's mark Historic	Dead
Bangalow Creek ST Historic 3	<i>Eucalyptus acmenoides</i> White Mahogany	>100 - <150	>50 - <75	Historic – burl removal probably wood turner	Good
Cockle Creek ST2	<i>Corymbia maculata</i> Spotted Gum	300 - 400	>100 - <150	Aboriginal	Good
Diega Creek ST1	<i>Eucalyptus acmenoides</i> White Mahogany	>200 - <250	>100 - <150	Aboriginal	Good
Tree 5 (Diega Creek ST2)	<i>Eucalyptus umbra</i> Broad-leaved White Mahogany	100 - <150	>50 - <100	Natural	Poor
Diega Creek ST Historic 3)	<i>Angophora costata</i> Smooth Barked Apple	150 - <200	>100 - <150	Historic – possible food safe used by loggers	Fair
Diega Creek ST4	<i>Eucalyptus acmenoides</i> White Mahogany	150 - <200	1. 100 - <150 2. 100 - <150	Aboriginal both scars	Fair
Scarred Tree 3 (was Palmers Creek ST1)	<i>Eucalyptus umbra?</i> Broad-leaved White Mahogany	150 - <200	>50 - <100	Natural	Dead
Scarred Tree 4 Historic	<i>Eucalyptus acmenoides</i> White Mahogany	130 - <150	58	Surveyors Mark Historic	Fair
Scarred Tree 7	<i>Eucalyptus saligna</i> Sydney Blue Gum	≤200	>50 - <75	Natural	Fair
Scarred Tree 10 (Diega Creek)	<i>Angophora costata</i> Smooth-barked Apple	>200 - <250	100 - <150	Surveyor's mark Historic	Dead



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines, DEC AHIMS

0 0.5 1.0 1.5 km
1:30 000

Legend

 Continued Underground Mining Area	X Aboriginal Scarred Tree
 Longwall Progression	X Heritage Tree
 LALC Boundary	X Non-Cultural Tree
 Proposed Underground Workings	
 Former Underground Workings	
— Drainage Line	

File Name (A4): R03_V1/2553_253.dgn

FIGURE 5.7

Scarred Trees Assessed by UTM

Of the 11 potential scarred trees recorded, the arboriculturalist assessed that three of the trees (containing four scars) were most likely to have been caused by removal of bark/wood by Aboriginal people (refer to **Plates 39 to 42**). Three trees were assessed as having scars that were surveyor's marks, one scar that had resulted from burl removal in recent times (most likely by a wood turner as the burls make impressive bowls) and one scar that had resulted from loggers cutting a compartment into the tree for food storage (most probably copying scars they had observed left by Aboriginal people within the forest). The scars on the final three trees were assessed as natural in origin.

One of the trees assessed as having Aboriginal scarring was in the Cockle Creek catchment and two were in the Diega Creek catchment. There were no scarred trees of Aboriginal origin identified within the Bangalow Creek, Boggie Creek and Palmers Creek catchments.

Scarred trees are a site type that is becoming rarer as they have a finite life and the period since the traditional practice of removing bark/wood from trees for economic purposes (e.g. to make wooden bowls, shields, swords, boomerangs, shelter, footholds) is in most areas in excess of the life of most trees (and considering most trees chosen for bark removal were mature or close to mature at that time), meaning that in most areas few scarred trees remain living and those that have died are often in poor condition.

The three Aboriginal scarred trees located within the proposed continued underground mining area were assessed as ranging in age between 400 years and 150+ years and thus were living at a time when Awabakal people were still able to conduct traditional practices in the Sugarloaf Range area. The scars on the trees; however, suggest that they are in the vicinity of 150 years old indicating that the traditional practice of removing bark/heartwood from trees had continued past the early European settlement of the Newcastle area.

The scars on two of the trees (Cockle Creek ST2 and Diega Creek ST1) have been identified by ADTOAC, ATOAC and KLALC as being related to ceremony (refer to **Section 6.1**). The Aboriginal cultural significance of the three scarred trees will be presented in **Section 6.1** and the archaeological significance within **Section 6.2**. The heritage significance of the trees assessed as being of historic origin will be assessed in the Historic Heritage Assessment prepared for the EA (Umwelt 2009c).

5.4 Discussion - Sites Located During the Survey

Table 5.25 provides a summary of the sites located during the survey/previous surveys within and in proximity to the proposed continued underground mining area. The table includes the newly recorded and previously recorded sites and includes a small number of sites that were located during the survey but which fall outside the proposed continued underground mining area. These sites are included to inform this discussion. The sites have been summarised by catchment area and fall of the range (e.g. eastern fall, western fall) in order to observe whether there is any patterning apparent in the way that the Awabakal people were utilising the area.

From **Table 5.25** it can be noted that:

- a total of 62 sites were recorded during the survey/previous surveys within (52 sites) and in proximity to (10 sites) the proposed continued underground mining area;
- six site types were recorded:
 - grinding grooves;
 - grinding grooves associated with a rockshelter with an isolated find;



PLATE 39
Cockle Creek Scarred Tree 2



PLATE 40
Diega Creek Scarred Tree 1



PLATE 41
Diega Creek Scarred Tree 4, Scar 1



PLATE 42
Diega Creek Scarred Tree 4, Scar 2

- a rockshelter with artefacts and PAD¹⁷;
 - artefact scatters and isolated finds;
 - scarred trees; and
 - stone arrangements;
- Cockle Creek (39%) and Diega Creek (35%) catchments had the highest percentage of sites followed by Bangalow Creek (18%), Palmers Creek (5%) and Boggy Hole Creek (3%);
 - Bangalow Creek (45%) and Diega Creek (30%) had the highest percentage of grinding groove sites;
 - Bangalow Creek (44%) and Palmers Creek (33%) catchments had the highest percentage of grinding grooves; however
 - Palmers Creek had the greatest diversity of groove types;
 - Cockle Creek (53%) and Diega Creek (36%) had the highest percentage of artefact scatter and isolated find sites; and
 - Cockle Creek (53%) and Diega Creek (38%) had the highest percentage of artefacts located within the artefact scatter and isolated find sites; and
 - Diega Creek on the eastern fall of the Sugarloaf Range had the artefact scatter with the highest number of artefacts (46 in GNW1 – #38-4-0995);
 - only one rockshelter with artefacts and PAD was located in the Cockle Creek catchment on the eastern fall of the Sugarloaf Range;
 - one rockshelter with a single surface artefact and no PAD was located within the Bangalow Creek catchment in association with the #38-4-0462 site on the western fall of the Sugarloaf Range;
 - two stone arrangements were located; one within the Cockle Creek catchment and one within the Diega Creek catchment both on the eastern fall of the Sugarloaf Range; and
 - Aboriginal scarred trees were confined to the Cockle Creek (33.3%) and Diega Creek (66.7%) catchments both on the eastern fall of the Sugarloaf Range.

¹⁷ ADTOAC – Shane Frost pers.com. 4 June 2010 would like it noted that he feels that the Cockle Creek Grinding Grooves 1 site was also associated with a rockshelter which he believes was used by Aboriginal people, however, there was no visible evidence of this use at the time of the survey and thus it was not recorded as a site.

Table 5.25 - Summary of Sites/Catchment Area

Catchment	Grinding Groove Sites (% of total grinding groove sites)	# Grooves (% of total grinding grooves)	Type of Grooves	Artefact Scatters/Isolated Finds (% of total artefact sites)	# Artefacts (% of total artefacts)	Rockshelter with Artefacts/PAD (% of total rockshelters with Artefacts/PAD)	Stone Arrangements (% of total stone arrangements)	Scarred Trees (% of total scarred trees)	Total Sites (% of total sites)	# Site Types
Bangalow Creek Western fall of the Sugarloaf Range	9 (45%) Including one grinding groove site with an associated rockshelter no PAD	86+ (44.3%)	axe, hatchet, food or ochre preparation	2 (6%)	9 (4%)	0	0	0	11 (18%)	3 Including one grinding groove site with an associated rockshelter no PAD
Boggy Hole Creek South-western fall of the Sugarloaf Range	0 (0%)	0 (0%)	N/A	2 (6%)	13 (5%)	0	0	0	2 (3%)	1
Cockle Creek Eastern fall of the Sugarloaf Range	2 (10%)	3+ (1.5%)	hatchet	19 (52%)	130 (53%)	1 (100%)	1 (50%)	1 (33.3%)	24 (39%)	5
Diega Creek Eastern fall of the Sugarloaf Range	6 (30%)	42+ (21.6%)	axe, hatchet	13 (36%)	94 (38%)	0	1 (50%)	2 (66.7%)	22 (35%)	3
Palmers Creek South-eastern fall of the Sugarloaf Range	3 (15%)	63 (32.4%)	axe, hatchet, chisel spear point and/or direction marker	0 (0%)	0 (0%)	0	0	0	3 (5%)	1
Total	20	194+	5 types	36	246	1	2	3	62	6 types

Overall, it appears that the Cockle Creek and Diega Creek catchments on the eastern fall of the Sugarloaf Range were important resource areas/occupation areas favoured for most activities (with the exception of implement grinding in the Cockle Creek catchment). Bangalow Creek (western fall of the Sugarloaf Range) and Palmers Creek (south-eastern fall of the Sugarloaf Range) while being favoured areas for the grinding of stone implements, appear to have been less favoured for other activities. However, it should be noted that a much larger area of the Cockle Creek and Diega Creek catchments are within the proposed continued underground mining area while only the very upper reaches of Bangalow Creek, Palmers Creek and Boggy Hole Creek (south-western fall of the Sugarloaf Range) were within the proposed continued underground mining area. Thus the differences observed in site types, site occurrence and site density are most likely being biased by the differences in landforms/area being surveyed between the catchments. Further survey to the north, west and south of the current continued underground mining area would assist with gaining a greater understanding of the Aboriginal use of the landscape and any differential use of the creek catchments and/or fall of the Sugarloaf Range country.

5.4.1 Restriction of Access

In **Section 3.0 Part C** it was predicted that the nature of the sites might provide some insight into the theory that the 'Puttikan' legend resulted in a restriction of access to parts of the Sugarloaf Range area that may be reflected by the archaeology. In this regard the artefact scatter sites located within the proposed continued underground mining area are very small when compared to those recorded along the coast or further inland. This suggests that visits to the area did not incorporate stays of long duration or by more than a small group of people. This scenario may reflect a restriction of access; however, the ruggedness of the terrain may also have made the area unattractive to larger groups that would have included small children and the elderly. Thus the restriction may be due to topography rather than the 'Puttikan' legend. However, if the grinding grooves are interpreted as representing the results of a male activity, then some gender based restriction may be in evidence, especially in the upper reaches of Bangalow Creek.

The only evidence that suggest a female presence is the bowl-like depression in the Bangalow Creek Grinding Groove 4 site, however, this may also have been used to grind ochre and not plant foods - an activity that may also be male oriented.

Overall, the archaeology does suggest the area was utilised by small groups of people, most probably males and thus could support the Puttikan legend; however, more survey is required throughout the Sugarloaf Range area to strengthen this argument from an archaeological perspective (understanding that this form of evidence is not required to support spiritual beliefs held by the Awabakal people or to determine importance of place).

5.5 Review - Objectives of the Survey Strategy

One of the objectives of the survey was to locate any grinding grooves or rockshelter sites that may be present in the proposed continued underground mining area. These (sandstone) site types are considered to have the highest potential to be adversely impacted by subsidence following underground mining. Sandstone platforms, benches and creekbeds on which grinding grooves occur, can crack due to subsidence (Nanson and Young 1983) and rockshelters and overhangs can develop tension cracking resulting in changes to rock surface hydrology, blockfall, accelerated chemical and physical weathering and/or total collapse (Lambert 1989). The survey was successful in locating 17 previously unrecorded grinding groove sites and rerecording three of the previously known grinding groove sites and thus was successful in this endeavour. While it is acknowledged that it is possible that further grinding grooves sites may be located within the proposed continued underground

mining area, it is assessed that an adequate sample of the area has been surveyed from an archaeological perspective. It is noted that ADTOAC and ATOAC would have preferred the survey continue to give total coverage of the target areas.

Only two rockshelters (Cockle Creek Rockshelter with Artefacts and PAD and the rockshelter associated with the #38-4-0462 grinding groove site in the Bangalow Creek catchment) were located that exhibited evidence of having been used by Aboriginal people. Eleven other rockshelters were observed, however, none of these contained archaeological evidence to support use (the majority had no deposits). Once again, while it is acknowledged that further rockshelter sites may exist within the proposed continued underground mining area it is assessed that an adequate sample of the area has been surveyed.

In relation to this finding, ADTOAC (Shane Frost 4 June 2010) provided the following comment.

The other 11 rockshelters may have contained archaeological evidence but weren't examined to what we would consider an appropriate level to ascertain the existence of archaeological evidence.

In response, it is noted that unless archaeological evidence is present within the rockshelters; or assessed as likely in a subsurface context within the few shelters that had deposits; it is not possible to record them as sites or PADs. To do so would result in a substantial misrepresentation of the archaeological record. This does not deny that Aboriginal people may have used the rockshelters, nor does it seek to demean the importance of the rockshelters - which is why they have been recorded as landscape features of Aboriginal cultural value and have been assessed by the registered Aboriginal stakeholders in the same manner as the Aboriginal archaeological sites.

Landforms in proximity to watercourses were also selected as areas with potential to contain archaeological sites and were targeted by the survey as these areas are also likely to be impacted by mine subsidence through the need for remediation works (to correct ponding). Poor ground surface visibility due to vegetation and leaf litter limited the areas where artefacts could be observed associated with watercourses and the majority of the artefact sites were located on graded tracks/4WD tracks and motor bike tracks that followed ridge and spur crests and crossed midslope benches. These sites were located on low gradient crests between the watercourses. Overall the artefact scatter and isolated finds were found to have poor integrity and thus to have no likelihood of PAD (refer to **Section 5.3.1** for the definition of a PAD – which is not the same as 'artefacts in a subsurface context' which have not been discounted for many of the sites – refer to **Table 5.22**) due to historic impacts from logging and track construction. While it is acknowledged that further artefact scatter and isolated find sites may exist within the proposed continued underground mining area it is assessed that an adequate sample of the area has been surveyed and that all such sites would have been severely impacted by past ground disturbance.

In relation to this finding, ADTOAC (Shane Frost 4 June 2010) provided the following comment.

We would disagree that due to logging and other activities the artefact sites have no likelihood of PAD due to historic impacts and that we also disagree that all such sites would have been severely impacted by past ground disturbance.

In response, the preceding paragraph has been revised to include the reference to the definition of PAD and how this differs from artefacts in a subsurface context that have been disturbed by works such as track construction (which included tree removal and substantial

subsurface impact) and logging which has resulted in ground disturbance and slope erosion throughout the proposed underground mining area.

In addition, the survey also located three scarred trees (Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4) and two stone arrangements (Cockle Creek SA1 and Diega Creek SA1). While it is possible that further scarred trees and stone arrangements may be located within the proposed continued underground mining area, it is assessed that an adequate sample of the area has been surveyed.

In relation to this finding, ADTOAC (Shane Frost 4 June 2010) provided the following comment.

We believe that more survey was necessary considering the amount of sites and rich archaeological area that Sugarloaf Range demonstrates.

In response, it is acknowledged that any archaeological survey methodology that is not 100% survey is unlikely to be seen as culturally appropriate or sufficient from the point of view of the registered Aboriginal stakeholders. It is noted, however, that the survey set out to inspect those areas that were most likely to have sites that would be impacted adversely by subsidence (i.e. rockshelter sites and grinding grooves). The success of the survey in locating these site types testifies to its suitability. The remainder of the proposed continued underground mining area was subject to an extensive survey program (refer to **Figure 5.1**) that even resurveyed previously surveyed areas. It was never the purpose of the agreed survey methodology (refer to **Section 4.0**) to undertake total coverage of the proposed continued underground mining area as this form of survey is not feasible in such difficult terrain and for an area the size of the proposed continued underground mining area.

Overall it is concluded that the survey strategy was successful in being able to provide sufficient information for a well informed archaeological assessment of the proposed continued underground mining area.

5.6 Review of the Predictive Model

The predictive model developed in **Section 3.0 Part D** identified the likely site types to occur within the proposed continued underground mining area, and their likely distribution, content and integrity. **Table 5.26** compares archaeological survey results with the predictions made, to further refine the current understanding of the archaeology of the proposed continued underground mining area.

In summary the predictive model was supported with the exception of the following:

- the morphology of the grinding grooves measured during the survey indicate that a broader range of activities are taking place than just the grinding of axes, hatchets and adzes including grinding and resharpening chisels and spear points and possibly food and/or ochre preparation;
- no evidence of the grinding out of potholes to enlarge their capacity to hold water to assist with grinding; as has been recorded elsewhere (ALALC 2003) in the Sugarloaf Range was noted; however, many of the potholes observed were filled with sediment and thus could not be adequately assessed;
- no art sites were located (pigment or engraving) despite art sites being known in the Sugarloaf Range area suggesting that these are even rarer sites than predicted;

- while many rockshelters were located along clifflines only two (Cockle Creek Rockshelter with Artefacts and PAD and #38-4-0462 Grinding Grooves with Rockshelter and Isolated Find) had evidence of Aboriginal use/occupation. While many of the others may have been used by Aboriginal people no archaeological evidence of that use remains. Thus rockshelters with evidence of Aboriginal use/occupation are even rarer than predicted;
- artefact scatters and isolated finds were rarely located in association with watercourses;
- the raw materials used for artefact manufacture and discarded in the sites provide no clear evidence supporting Aboriginal people other than Awabakal using the area. Further survey is required in the surrounding Sugarloaf Range area to gain a greater sample of sites to investigate this further; and
- though a restriction of access to the Sugarloaf Range area is indicated by the archaeological evidence; it is not clear if this relates to the 'Puttikan' legend or is a reflection of the rugged topography of the area which may have acted to restrict access anyway. The prediction of restriction of access relating to the 'Puttikan' legend could be supported; however, further survey is required in the Sugarloaf Range area to gain a greater sample of sites to investigate this further from an archaeological perspective (understanding that this form of evidence is not required to support spiritual beliefs held by the Awabakal people or to determine importance of place).

Table 5.26 - Review of the Predictive Model

Prediction	Survey Result	Assessment of Predictive Model
The mostly likely Aboriginal sites to occur are grinding grooves and sites containing stone artefacts (either artefact scatters or isolated finds).	Grinding Grooves and sites containing stone artefacts were the most commonly recorded site types.	Predictive model is supported.
Sites containing stone artefacts are likely to be located in association with creeks, ephemeral drainages or persistent water features ('wet soaks'). These artefacts are most likely to be visible in areas where ground surface visibility is favourable such as on vehicle tracks and areas of disturbance.	One site (Western Domain 5) was associated with a wet soak and one site Western Domain 9 was located in association with a watercourse. These sites were previously known and the nature of these sites had informed the predictive model. However, the results of survey indicated that sites containing stone artefacts are more likely to be located on crests of level gradient associated with spurs and ridges and that they were more likely to be between the watercourses, rather than in proximity to them. However, it should be noted that due to the large number of low order tributaries in the proposed continued underground mining area, no site was ever far from a tributary. A second wet soak identified during the survey did not have any visible artefacts. It was assessed that this wet soak drained fairly quickly and was not as reliable a water source as Western Domain 5. It should also be noted that ground surface visibility was highly restricted along the watercourses surveyed and that this may have biased the results to some degree.	The predictive model is partially supported. Sites containing stone artefacts have been located near watercourses but only where ground surface visibility is good.
Stone artefacts may also be located on lower slopes/footslopes adjacent to creeks and on the ridgelines and spurs, which were used as the major thoroughfares allowing people access to and from the steep sandstone landscape.	As above.	The predictive model is supported for ridge crests and spur crests but not in relation to watercourses.

Table 5.26 - Review of the Predictive Model (cont)

Prediction	Survey Result	Assessment of Predictive Model
Stone artefacts may also be expected to occur at the heads of valleys based on ethnographic accounts of hunting activity in the area.	A number of artefact scatter sites were located on the main Sugarloaf Range ridge crest and on major spurs running up to this crest. These sites could be interpreted as being at the heads of valleys, though it would appear that they are more closely related to the use of the spurs and the ridge crest as travelways than to do with hunting activities. Larger artefact site and artefact samples are required to gain a greater understanding of the task being undertaken within the sites.	Further data is required to assess if the predictive model is supported/refuted.
Grooves from the grinding of axes, hatchets and adzes are known to occur within the proposed continued underground mining area and it is highly likely that further grinding grooves will be located within this area. Grinding grooves are generally located within the channels of drainage lines at the heads of valleys, in areas around rock pools on ridge tops, on rock platforms near seepages and on rock platforms within or alongside the drainage lines in the base of the valleys (it is known that water was utilised as a lubricant during grinding - Vinnicombe 1980, Dickson 1980, Umwelt 2004a). The grinding grooves may have associated pot holes that have been ground out to hold water for drinking and use while grinding.	20 sets of grinding grooves were located/relocated during the survey. The grinding grooves were located on sandstone benches, platforms and on the sandstone creekbeds. The grooves were however recognised to relate to the grinding of not just axes, hatchets and adzes but also to chisels and spears. One groove was also associated with grinding of possibly food or ochre. The grooves were associated with small waterholes and/or potholes which would have held water for a period of time after moderately heavy/prolonged rain. No evidence was observed of the potholes being ground out.	The predictive model is supported for most predictions related to the location of grinding grooves. However, the grinding was not all related to axes, hatchets and adzes and there was no evidence noted of potholes being enlarged and it is probable that this was not necessary as in most cases where these occurred they were sufficiently large to supply enough water for the grinding process. It should also be noted that many potholes had been infilled by sediment and it is possible that some of these may have been ground out.

Table 5.26 - Review of the Predictive Model (cont)

Prediction	Survey Result	Assessment of Predictive Model
Evidence contained within rockshelters (should they occur within the proposed continued underground mining area and immediate surrounds) may include stone artefacts and/or hearths either on the surface or within the floor deposits, axe grinding grooves and/or rock art (either pigment or engraved).	Two rockshelters with archaeological evidence of occupation were recorded during the survey. One rockshelter (#38-4-0462) had a single quartzite core and no floor deposits. A single grinding groove was also recorded in the adjacent creekbed. The second rockshelter (Cockle Creek Rockshelter with Artefacts and PAD) had a sandy floor deposit assessed as PAD. Two artefacts were observed in the dripline of the shelter and fragmented charcoal and staining of the deposits suggest that it may contain evidence of hearths.	The predictions are supported by the two rockshelter sites located within the proposed continued underground mining area with the exception that no art (either pigment or engraved) was observed. This suggests that these site types are even rarer than predicted.
The flood event of June 2007 had the power to remove and transport sediments along the high flow ephemeral drainages and creeklines within the proposed continued underground mining area. The movement of this sediment load may have acted to expose grinding grooves in previously surveyed areas and may also have buried previously recorded grinding groove sites.	Several unrecorded grinding groove sites were located in areas previously subject to inspection/survey in 1997 (Warren Bluff) and 2005 (Umwelt). It is assumed that these sites are now visible due to the removal of sediment which previously obscured them.	Predictive model is supported.
The existence of rockshelters in the proposed continued underground mining area and immediate surrounds is considered possible should suitable sandstone formations be present (i.e. cliffines, large boulders); however, the majority of these will probably have no evidence of occupation.	Many rockshelters were located during the survey period, however, not all of the rockshelters were suitable for occupation due to factors such as their size, the degree of difficulty of their access and/or the gradient of the floor of the shelter. There were rockshelters that could have provided shelter for one or two people from inclement weather, however, there was no archaeological material in these shelters to support their recording as sites. Only one out of the 13 rockshelters observed exhibited evidence of use.	The predictive model is supported.
Evidence contained within rockshelters (should they occur within the proposed continued underground mining area and immediate surrounds) may include stone artefacts and/or less likely, hearths either on the surface or within the floor deposits, grinding grooves and/or rock art (either pigment or engraved).	Only the Cockle Creek Rockshelter with Artefacts and PAD was recorded as having surface stone artefacts and charcoal staining that may relate to a hearth/hearths. No grinding grooves or rock art was located within any of the rockshelters recorded.	The predictive model is only partially supported and should be revised as rockshelters with art or grinding grooves are rarer than expected.

Table 5.26 - Review of the Predictive Model (cont)

Prediction	Survey Result	Assessment of Predictive Model
Rock art sites (including pigment and engraved art) may be contained within the proposed continued underground mining area and immediate surrounds should suitable geological features such as sandstone platforms and shelters occur. The engraving sites may occur on ridgelines on sandstone platforms with extensive outlooks and/or on platforms located at the heads of valleys (McDonald 2007, Vinnicombe 1980 XI: 6-7). Engravings may also be recorded on sandstone boulders and on vertical sandstone surfaces, most often in close proximity to water courses (McDonald 2007).	Despite survey of the appropriate landforms and the location of appropriate rockshelters/rock platforms/boulders no engraved or pigment art was observed.	The predictive model is not supported, no rock art sites were located. Rock art sites are, therefore, rarer than predicted.
Aboriginal oral history and ethnographic accounts suggest that burials marked by stone arrangements or crying trees could occur within the proposed continued underground mining area if mature trees remain.	No crying trees were observed. The Diega Creek Stone Arrangement 1 site was recorded in association with a scarred tree (Diega Creek ST3), however, this scarred tree was assessed as being a surveyor's blaze.	The predictive model was not supported.
Aboriginal oral history suggests that scarred trees (some of which may be related to ceremony) could occur within the proposed continued underground mining area if mature trees remain.	Three trees exhibiting a total of four scars were assessed by an Arboriculturalist to be of Aboriginal origin (refer to Appendix F). The scars on two of the trees (Cockle Creek ST2 and Diega Creek ST1) have been identified as likely to be related to ceremony (refer to Section 3.0 Part A).	Predictive model is supported.

Table 5.26 - Review of the Predictive Model (cont)

Prediction	Survey Result	Assessment of Predictive Model
Ethnographic accounts and the topography of the area, as well as previous regional models for Aboriginal landscape use within the Sugarloaf Range area suggest that the spurs and ridges would have provided access to, and negotiation of, the steep escarpment country and a travelway through the area to and from the swamp country in the north and the continuation of the steep escarpment country in the south/south-west. The spurs and ridges would have provided travel paths not only for the local Awabakal people but may also have provided access to other groups for whom entry into the area, possibly for trade or exchange as well as ceremonial activity was sanctioned by the Awabakal.	The location of artefact scatters and isolated finds along the ridge and spur crests and on midslope benches supports the Aboriginal oral history. The majority of the stone used for artefact manufacture within the sites was Nobby's tuff and a darker, more porous tuff both of which are available within Awabakal territory. Other raw materials observed included quartzite and quartz (both available from the local conglomerates); basalt reported by ADTOAC (Shane Frost pers. com. 4 June 2010) to be available locally within the Sugarloaf Range) and silcrete reported by ADTOAC (Shane Frost pers. com. 4 June 2010) to be available in the Shortland area. The provenance of the mudstone is more problematic. This raw material is readily available from cobble beds within the Hunter River; however, not within the section of the Hunter River within what is currently recognised as Awabakal territory.	The predictive model is supported in relation to travelways. The majority of the raw materials used for artefact manufacture were locally available (tuff, quartz, quartzite, basalt and possibly silcrete). The likely provenance of the mudstone is close enough that the Awabakal may have had access, though it is possible that these raw materials were obtained by trade or exchange or left by visitors. The latter is thought unlikely.
Archaeological evidence of visitors to Awabakal traditional land may therefore occur in the proposed continued underground mining area in the form of stone artefact manufacture from stone sources outside Awabakal lands. Should such stone artefacts occur identification of their provenance could indicate the group affiliation of past visitors into Awabakal country.	It is possible, however, that recent (post European) sediment loads in the Hunter River have acted to bury cobble beds that may once have been available to Awabakal people. It is also possible that the stone was obtained from further upstream by trade or exchange, or that the Awabakal had free access further upstream (indicating their territory was more extensive inland than currently thought), or that they were left by visitors to Awabakal territory. The latter is thought unlikely as most sites are dominated by locally available raw materials suggesting discard by Awabakal people. Further survey is required to the north, south and west to obtain greater insight into questions related to tribal boundaries and visitors from out of country.	Further survey is required to the north, south and west to obtain greater insight into questions related to tribal boundaries and visitors from out of country and to prove/disprove this part of the model.

Table 5.26 - Review of the Predictive Model (cont)

Prediction	Survey Result	Assessment of Predictive Model
Should a restriction of access to the Sugarloaf Range have arisen in relation to the stories related to 'Puttikan' (refer to Section 3.0 Part C) it may be reflected in the form of gendered material evidence (Umwelt 2006c) or differential frequencies of archaeological evidence may be observed between the range country and the lowlands.	The artefact scatter sites located within the proposed continued underground mining area are very small when compared to those recorded along the coast or further inland. This suggests that visits to the area did not incorporate stays of long duration or by more than a small group of people. This scenario may reflect a restriction of access; however, the ruggedness of the terrain may also have made the area unattractive to larger groups that include small children and the elderly. Thus the restriction may be due to topography rather than 'Puttikan'. The grinding grooves may be interpreted as representing a male activity. The only evidence that suggest a female presence is the bowl-like depression in the Bangalow Creek Grinding Groove 4 site, however, this may also have been used to grind ochre and not plant foods. Overall, the archaeology does suggest the area was utilised by small groups of people, most probably males and thus could support the Puttikan mythology; however, much more survey is required throughout the Sugarloaf Range area to strengthen this argument (understanding that this form of evidence is not required to support spiritual beliefs held by the Awabakal people or to determine importance of place).	Restriction of access is indicated by the archaeological evidence. This may relate to the 'Puttikan' legend or may simply reflect the rugged topography of the area. The prediction of restriction of access could be supported; however, further survey is required in the Sugarloaf Range area to strengthen this argument (understanding that this form of evidence is not required to support spiritual beliefs held by the Awabakal people or to determine importance of place).

6.0 Significance Assessment

Cultural heritage significance is a measure of the relative value or importance of heritage sites. Significance is assessed according to principles outlined originally in Australia in the Burra Charter (1979), which was adapted from the UNESCO sponsored ICOMOS (International Council for Monuments and Sites) Venice Charter. The assessment of significance assists in the determination of appropriate cultural heritage management procedures for sites/artefacts that may be threatened by development activities. Assessing the significance of Aboriginal archaeological sites is an extremely complicated process that must take into account the interests of many parties.

The Burra Charter defines cultural significance as the 'aesthetic, historic, scientific or social value for past, present or future generations' of a place. The NSW NPWS (1997 – now part of the DECCW) provides further discussion on the assessment of cultural significance for Aboriginal archaeological sites. Categories of significance relevant to Aboriginal archaeological sites include Aboriginal significance, archaeological/scientific significance, aesthetic significance, tourism potential and educational significance. *The NSW NPWS Guidelines for Archaeological Report Writing* (1997: 25) states:

While Aboriginal sites and places may have educational, tourism, and other values to groups in society their principle values are likely to be in terms of their cultural/social significance to Aboriginal people and their scientific significance to archaeologists. It is thus possible to identify two main streams in the overall significance assessment process: the assessment of cultural/social significance to Aboriginal people and the assessment of scientific significance to archaeologists.

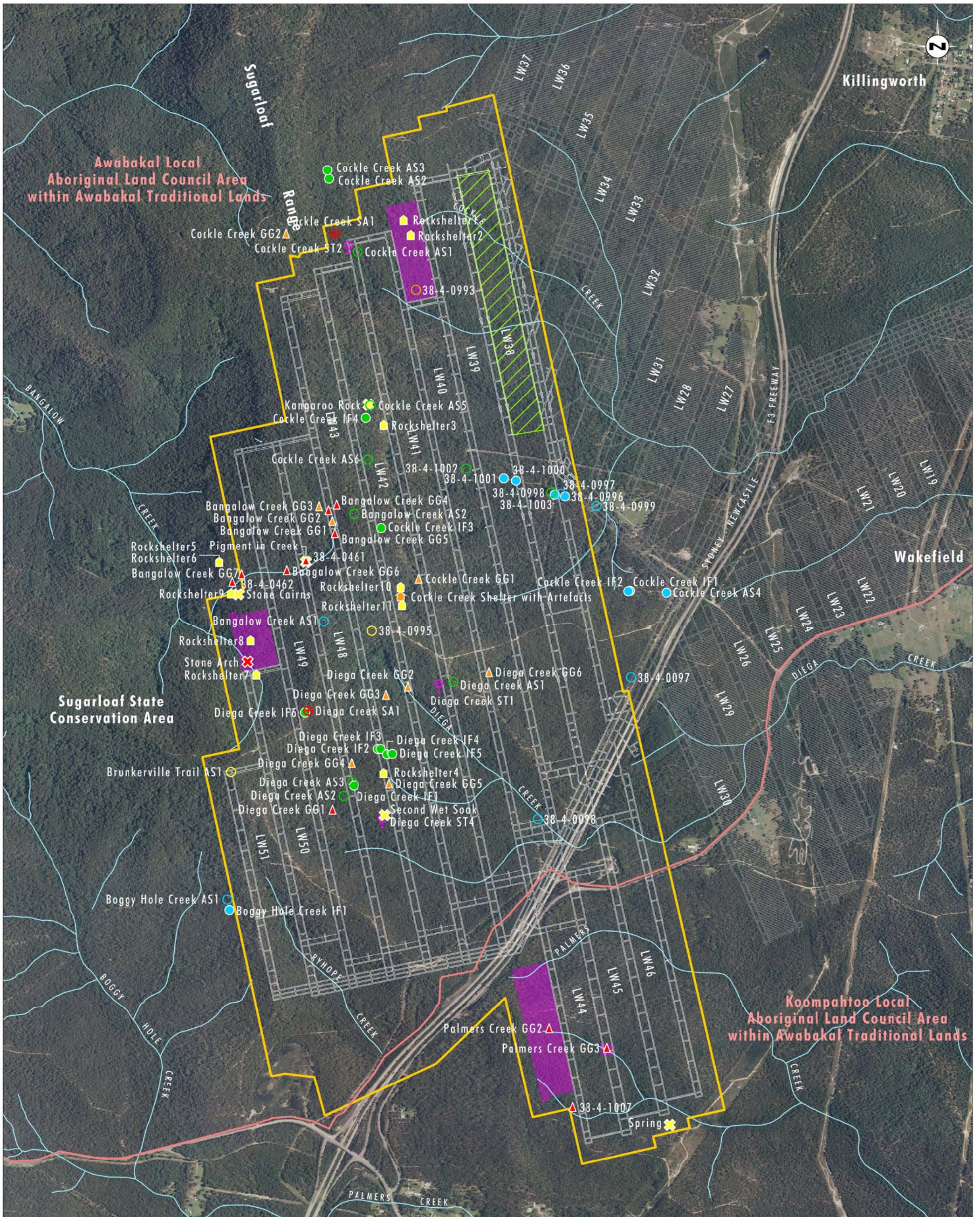
Therefore, within this report the significance of the sites within the proposed continued underground mining area will be assessed in relation to their Aboriginal cultural significance and their archaeological significance. The criteria for assessing each type of 'significance' will be detailed in the sections to follow. The archaeological significance assessment of the sites recorded during the survey for this project and those previously recorded will be discussed and justifications for the significance ranking provided. Descriptions of the sites are provided in **Section 5.3** and the locations of the sites are shown on **Figures 6.1** and **6.2**.

6.1 Aboriginal Cultural Significance

Aboriginal cultural significance can only be assessed by the registered Aboriginal stakeholders and often varies from that of archaeological significance. Throughout the project it has been made clear by the ALALC, ADTOAC, ATOAC, CCC and KLALC that the entire project area and its surrounds are of traditional, historic and contemporary cultural significance to the Awabakal people and the Aboriginal people that live within Awabakal Lands (refer to **Appendices A, B, J and L**).

Awabakal Descendants Traditional Owners Aboriginal Corporation

Our connection with our Traditional Country is what makes us who we are and this is reflected through the Sugarloaf Range. It is not just a Physical characteristic but also a Spiritual connection we have to our Country. The Sugarloaf Range has been and continues to be a significant and inspiring aspect regarding the implementation and understanding of Cultural Heritage for our People. We cannot sit back and flippantly consent to the loss of more of our Cultural Heritage whether there is one site or many, because this only results in a tearing and further dislocation for our People. It disturbs us knowing that in the past and even now our people along with our Cultural Heritage and Traditional Country have been regarded by some as negligible and treated with contempt



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

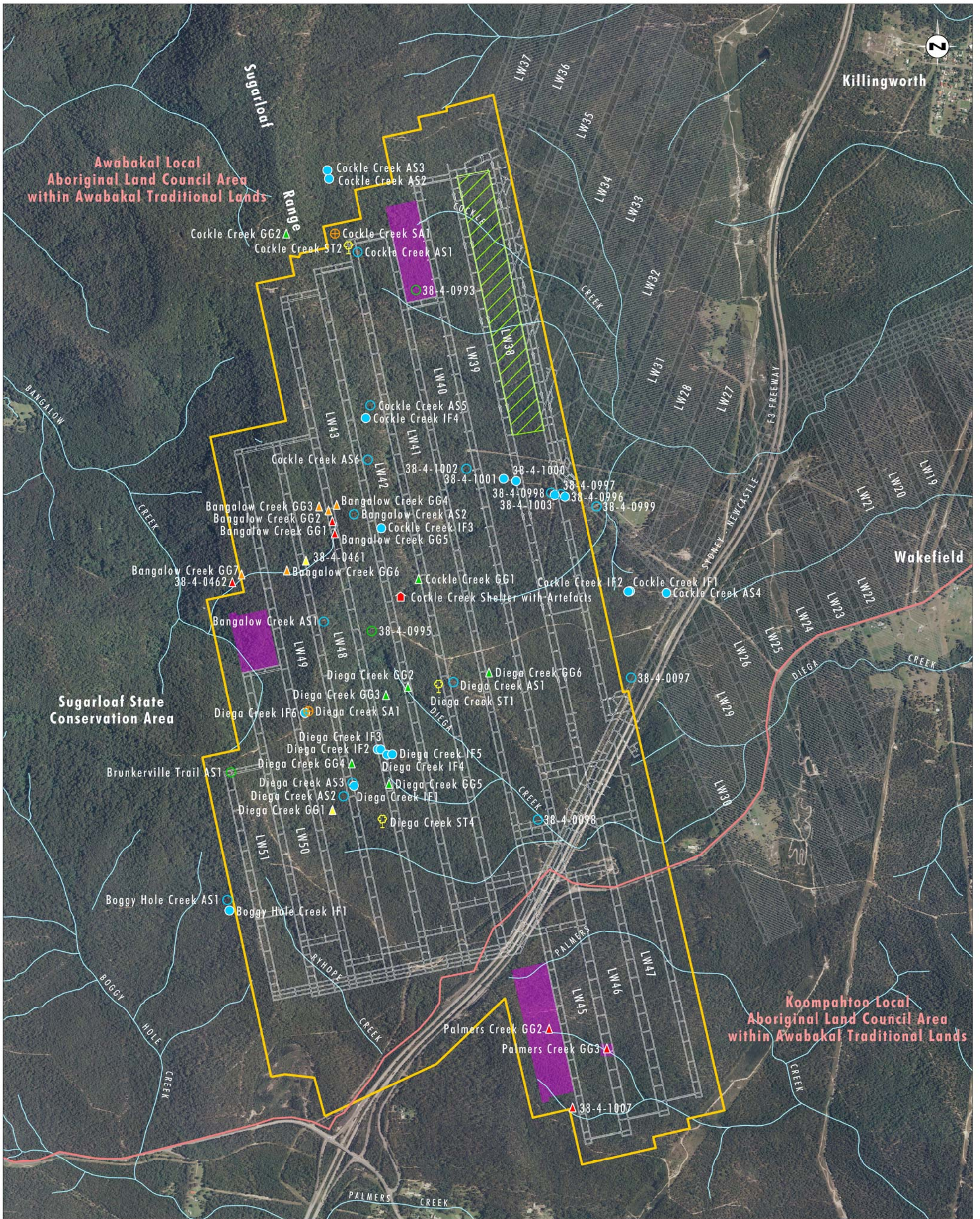
- Artefact Scatter
- Isolated Find
- ▲ Axe Grinding Groove
- Shelter with Deposit
- ⊕ Stone Arrangement
- ♀ Scarred Tree
- ✕ Feature of Aboriginal Cultural Value
- Rockshelter of Aboriginal Cultural Value

Significance Level

- Extremely High
- Very High to Extremely High
- Very High
- High to Very High
- High
- Moderate to High
- Moderate

FIGURE 6.1

Aboriginal Cultural Site /
Landscape Feature Significance



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- Artefact Scatter
- Isolated Find
- ▲ Axe Grinding Groove
- Shelter with Deposit
- ⊕ Stone Arrangement
- ♀ Scarred Tree

- Significance Level
- High
 - Moderate-High
 - Moderate
 - Low-Moderate
 - Low

FIGURE 6.2
Archaeological Site Significance

resulting in the very dilemma we are being faced with today. To alleviate the resulting problems they (developers) solicit ideas to produce solutions which are at the very best perplexing as alternate solutions. This is why it is imperative for respect and consideration to be shown concerning our Cultural Heritage and Traditional Country and an accurate focus applied regarding the need to involve at all stages the Awabakal People in the very dealings that may affect that Cultural Heritage and Traditional Country.

There is a great need for the protection and preservation of what is vital to our People in maintaining those Physical, Spiritual and Oral connections which are evidence of what our Ancestors have left us and which ultimately connects us through the combination of all these attributes of our Cultural Heritage to our Traditional Country.

As already pointed out the significance of place to our people is paramount but does not just rely on the presence of artefacts, grinding grooves, scarred trees or any visible evidence associated with the area. Although what does remain in the physical realm whether small or large, does in part connect us to our Ancestors and our Cultural Heritage being the physical reminder of what helped govern and guide the everyday lives of our people. We can reach out and touch and hold the very stones (artefacts) that they (our Ancestors) worked and fashioned into tools. We can visit the rock shelters and know they used these thousands of years previously. While at the grinding groove sites we can imagine being there with them as we touch the very surface of the sandstone they were sitting on and utilising in the production of an axe or to sharpen a spear.

*In this day and age it has become too easy due to ignorance, lack of connection and insufficient understanding of the entire picture, not to mention so called progress, to devalue and demean our People and our Cultural Heritage which have belonged and survived in our Traditional Country for thousands of years. The fact that this area is a contributing part of what makes us who we are and where we come from cannot be defined just as something tangible. The feeling of the area and the extensive connection we have with it and the awareness of knowing this is a connection that is confined to just a handful of people living today. Knowing because it was **OUR** ancestors, Awabakal People that walked upon it, this is sufficient enough for us to be adamant in conveying that we then have become part of the reason of what makes this place significant.*

Our people, the Awabakal, have for centuries looked after this area as part of our greater Traditional Tribal Country; it in turn has looked after us. This Sugarloaf Range holds many secrets which are significant to us and the many stories from the past connect us to it and these stories will continue to live and be significant because they live in us and are what connects us and makes us by birthright, Awabakal People. (Awabakal Descendants Traditional Owners Aboriginal 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

For thousands of years, the Awabakal people walked and lived within this land and passed down knowledge of their lores (laws), culture and customs as part of their fundamental educational and spiritual growth. Understandably, our Awabakal ancestors valued this aspect of human development.

The Sugarloaf Range has always been a prominent spiritual, physical and visual aspect of our culture and heritage, which is as inspirational today as it was to our

ancestral family, providing a steadfast aesthetic to the Awabakal cultural development, wellbeing and lifestyle.

Mt Sugarloaf is a majestic, iconic landmark that features prominently within this landscape, illuminating this regions mythology, mystery and organic presence that are quite simply, uniquely Awabakal. The Sugarloaf Range still to this day, has an undeniable amount of fascination and attention regarding its cultural value and 'purpose'.

The invisible aspects to the social interactions that were taking place are at times forgotten, nonetheless, when we visit those sites where they had left their mark, we are reconnecting on so many different levels to our Awabakal cultural environment, that can holistically interconnects us to the spirituality of this land with our past, present and future. By sustaining this experiential interconnectedness, we believe we perceive each day having the past, present and future fused within it.

These organic Awabakal landmarks within their cultural context intertwines us the unique opportunity to learn from our history, apply it to our daily lives and have a better opportunity at creating a brighter future.

We believe that every culture and spiritual tradition has a story to tell and that these stories are creative expressions that communicate the meaning of life and its mysteries. Our Aboriginal ancestral family, like all Australian First Peoples' ancestral family, have left creative and symbolic messages that are there to remind us in how to care for each other and our children within this landscape.

This land has had a wealth of knowledge walk over it, with each one of us deepening the footprints of our ancestral family, the Awabakal People" (Awabakal Traditional Owners Aboriginal Corporation 10 & 30 March 2010).

Awabakal Local Aboriginal Land Council

ALALC members have known for generations that there are many places in the Sugarloaf Range where evidence can be found of the Aboriginal people that hunted and gathered and attended ceremony in the range country. The 62 sites that were located during the survey represent tangible evidence of that use. All of the sites are culturally significant to us, however, the stone arrangements and grinding groove sites have exceedingly high significance, the Cockle Creek Rockshelter with Artefacts and PAD and the scarred trees have moderate to high significance and the stone artefact scatters and isolated finds are of lower significance (ALALC 11 March 2010).

Koompahtoo Local Aboriginal Land Council

All 62 Aboriginal archaeological sites located during the survey are very important to KLALC. Every one of those sites is culturally significant as they provide tangible evidence of the use of the area by Awabakal people. Of most significance are the grinding groove sites, the rockshelter site with artefacts and PAD, the stone arrangements and the scarred trees, These sites have high to extremely high Aboriginal cultural significance. Their teaching value for today and into the future is extremely important to us (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

6.1.1 Cultural Significance of Aboriginal Archaeological Sites within the Proposed Continued Underground Mining Area

Table 6.1 identifies the Aboriginal cultural significance of the sites located during the survey as assessed by each of the registered Aboriginal stakeholder groups. **Table 6.1A** provides details of the Aboriginal cultural significance of the sites as assessed by ADTOAC and ATOAC. **Figure 6.1** indicates each of the sites colour-coded according to their overall Aboriginal cultural significance. The overall cultural significance ranking has been reached through combining and averaging the assessments from each the registered Aboriginal stakeholder groups based on comments and advice they provided during consultation on the working and final draft report. Please note that CCC (17 June 2010) requested its significance ranking be removed from **Table 6.1** (refer to **Appendix J**).

Table 6.1 - Aboriginal Cultural Site Significance

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
Bangalow Creek Grinding Grooves 1	ADTOAC – <i>very high to extremely high significance</i> ATOAC – <i>very high to extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Very high to extremely high
Bangalow Creek Grinding Grooves 2	ADTOAC – <i>extremely high significance</i> ATOAC – <i>extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Extremely high
Bangalow Creek Grinding Grooves 3	ADTOAC – <i>very high to extremely high significance</i> ATOAC – <i>very high to extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Very high to extremely high
Bangalow Creek Grinding Grooves 4	ADTOAC – <i>extremely high significance</i> ATOAC – <i>extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Extremely high
Bangalow Creek Grinding Grooves 5	ADTOAC – <i>extremely high significance</i> ATOAC – <i>extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Extremely high
Bangalow Creek Grinding Grooves 6	ADTOAC – <i>extremely high significance</i> ATOAC – <i>extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Extremely high
Bangalow Creek Grinding Grooves 7	ADTOAC – <i>extremely high significance</i> ATOAC – <i>extremely high significance</i> ALALC – <i>extremely high significance</i> KLALC – <i>extremely high significance</i>	Extremely high

Table 6.1 - Aboriginal Cultural Site Significance (cont)

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
#38-4-0461	<i>ADTOAC – extremely high significance ATOAC – extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Extremely high
#38-4-0462 Grinding Grooves and Associated Rockshelter	<i>ADTOAC – extremely high significance ATOAC – extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Extremely high
Cockle Creek Grinding Grooves 1	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Cockle Creek Grinding Grooves 2	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Diega Creek Grinding Grooves 1	<i>ADTOAC – extremely high significance ATOAC – extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Extremely high
Diega Creek Grinding Grooves 2	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Diega Creek Grinding Grooves 3	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Diega Creek Grinding Grooves 4	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Diega Creek Grinding Grooves 5	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
Diega Creek Grinding Grooves 6	<i>ADTOAC – very high to extremely high significance ATOAC - very high to extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Very high to extremely high
#38-4-1007 (Palmer's Creek 1)	<i>ADTOAC – extremely high significance ATOAC – extremely high significance ALALC – extremely high significance KLALC – extremely high significance</i>	Extremely high

Table 6.1 - Aboriginal Cultural Site Significance (cont)

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
Palmers Creek Grinding Groove 2	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – extremely high significance</i> <i>KLALC – extremely high significance</i>	Extremely high
Palmers Creek Grinding Groove 3	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – extremely high significance</i> <i>KLALC – extremely high significance</i>	Extremely high
Bangalow Creek AS1	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Bangalow Creek AS2	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Boggy Hole Creek AS1	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Boggy Hole Creek IF1	<i>ADTOAC – very high</i> <i>ATOAC – very high</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Brunkerville Trail AS1	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – high significance</i>	High to very high
Cockle Creek AS1	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek AS2	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek AS3	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek AS4	<i>ADTOAC - very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate

Table 6.1 - Aboriginal Cultural Site Significance (cont)

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
Cockle Creek AS5	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek AS6	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek IF1	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Cockle Creek IF2	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Cockle Creek IF3	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Cockle Creek IF4	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek AS1	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek AS2	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek AS3	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek IF1	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek IF2	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high

Table 6.1 - Aboriginal Cultural Site Significance (cont)

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
Diega Creek IF3	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek IF4	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek IF5	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Diega Creek IF6	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
#38-4-0995 GNW1	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – high significance</i>	High to very high
Western Domain 1 (#38-4-0996)	<i>ADTOAC – very high</i> <i>ATOAC – very high</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Western Domain 2 (#38-4-0997)	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Western Domain 3 (#38-4-0998)	<i>ADTOAC - very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Western Domain 4 (#38-4-0999)	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Western Domain 5 (#38-4-0993)	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – extremely high significance</i>	Very high to extremely high
Western Domain 6 (#38-4-1000)	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate

Table 6.1 - Aboriginal Cultural Site Significance (cont)

Site Name	Aboriginal Cultural Significance	Overall Cultural Significance
Western Domain 7 (#38-4-1001)	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Western Domain 8 (#38-4-1002)	<i>ADTOAC – very high to extremely high significance</i> <i>ATOAC – very high to extremely high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate to high
Western Domain 9 (#38-4-1003)	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
#38-4-0098 AS	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
#38-4-0097 AS	<i>ADTOAC – very high significance</i> <i>ATOAC – very high significance</i> <i>ALALC – low significance</i> <i>KLALC – culturally significant</i>	Moderate
Cockle Creek SA1	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – exceedingly high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Extremely high
Diega Creek SA1	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – exceedingly high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Extremely high
Cockle Creek Rockshelter with Artefacts and PAD	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – moderate to high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Very high to extremely high
Cockle Creek ST2	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – moderate to high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Very high
Diega Creek ST1	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – moderate to high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Very high
Diega Creek ST4	<i>ADTOAC – extremely high significance</i> <i>ATOAC – extremely high significance</i> <i>ALALC – moderate to high cultural significance</i> <i>KLALC – extremely high cultural significance</i>	Very high

Table 6.1A - ADTOAC and ATOAC Aboriginal Archaeological Site Significance

Site Name	Ceremonial/ Spiritual/ Dreaming Connection	Rarity	Inter- relatedness	Teaching Potential	Aesthetics of Site	Outlook	Total	Cultural Significance Assessment
<i>Bangalow Creek Grinding Grooves 1</i>	1	5	5	4	3	3	21	<i>very high to extremely high</i>
<i>Bangalow Creek Grinding Grooves 2</i>	1	5	5	5	5	4	25	<i>extremely high</i>
<i>Bangalow Creek Grinding Grooves 3</i>	1	5	5	4	3	3	21	<i>very high to extremely high</i>
<i>Bangalow Creek Grinding Grooves 4</i>	4	5	5	4	3	4	25	<i>extremely high</i>
<i>Bangalow Creek Grinding Grooves 5</i>	1	5	5	5	5	5	26	<i>extremely high</i>
<i>Bangalow Creek Grinding Grooves 6</i>	1	5	5	4	5	5	25	<i>extremely high</i>
<i>Bangalow Creek Grinding Grooves 7</i>	3	5	5	4	5	5	27	<i>extremely high</i>
<i>#38-4-0461</i>	1	5	5	4	5	5	25	<i>extremely high</i>
<i>#38-4-0462 Grinding Grooves and Associated Rockshelter</i>	1	5	5	5	5	5	26	<i>extremely high</i>
<i>Cockle Creek Grinding Grooves 1</i>	1	5	5	4	4	4	23	<i>very high to extremely high</i>
<i>Cockle Creek Grinding Grooves 2</i>	1	5	5	4	3	5	23	<i>very high to extremely high</i>
<i>Diega Creek Grinding Grooves 1</i>	1	5	5	4	5	5	25	<i>extremely high</i>
<i>Diega Creek Grinding Grooves 2</i>	1	5	5	4	4	4	23	<i>very high to extremely high</i>
<i>Diega Creek Grinding Grooves 3</i>	1	5	5	5	3	4	23	<i>very high to extremely high</i>
<i>Diega Creek Grinding Grooves 4</i>	1	5	5	4	3	4	22	<i>very high to extremely high</i>
<i>Diega Creek Grinding Grooves 5</i>	1	5	5	4	3	4	22	<i>very high to extremely high</i>
<i>Diega Creek Grinding Grooves 6</i>	1	5	5	4	3	4	22	<i>very high to extremely high</i>
<i>#38-4-1007 (Palmers Creek 1)</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Palmers Creek Grinding Groove 2</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Palmers Creek Grinding Groove 3</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Bangalow Creek AS1</i>	1	3	5	4	5	4	22	<i>very high to extremely high</i>
<i>Bangalow Creek AS2</i>	4	5	5	5	4	5	28	<i>extremely high</i>
<i>Boggy Hole Creek AS1</i>	1	3	5	4	4	4	21	<i>very high to extremely high</i>
<i>Boggy Hole Creek IF1</i>	1	3	5	4	3	4	20	<i>very high</i>
<i>Brunkerville Trail AS1**</i>	5	5	5	5	5	5	30	<i>extremely high</i>

Table 6.1A - ADTOAC and ATOAC Aboriginal Archaeological Site Significance (cont)

Site Name	Ceremonial/ Spiritual/ Dreaming Connection	Rarity	Inter- relatedness	Teaching Potential	Aesthetics of Site	Outlook	Total	Cultural Significance Assessment
<i>Cockle Creek AS1</i>	4	4	5	5	4	4	26	<i>very high to extremely high</i>
<i>Cockle Creek AS2</i>	4	4	5	4	4	4	25	<i>very high to extremely high</i>
<i>Cockle Creek AS3</i>	4	5	5	4	4	4	26	<i>very high to extremely high</i>
<i>Cockle Creek AS4</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Cockle Creek AS5</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Cockle Creek AS6</i>	5	4	5	4	5	5	28	<i>extremely high</i>
<i>Cockle Creek IF1</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Cockle Creek IF2</i>	2	3	5	4	3	3	20	<i>very high</i>
<i>Cockle Creek IF3</i>	4	4	5	4	4	5	26	<i>very high to extremely high</i>
<i>Cockle Creek IF4</i>	5	4	5	4	4	5	27	<i>very high to extremely high</i>
<i>Diega Creek AS1</i>	3	3	5	4	4	4	23	<i>very high to extremely high</i>
<i>Diega Creek AS2</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek AS3</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF1</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF2</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF3</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF4</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF5</i>	3	4	5	4	4	4	24	<i>very high to extremely high</i>
<i>Diega Creek IF6</i>	4	4	5	4	4	4	25	<i>very high to extremely high</i>
<i>#38-4-0995 GNW1</i>	5	4	5	4	4	5	27	<i>very high to extremely high</i>
<i>Western Domain 1 (#38-4-0996)</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Western Domain 2 (#38-4-0997)</i>	2	3	5	4	3	3	20	<i>very high</i>
<i>Western Domain 3 (#38-4-0998)</i>	2	3	5	5	3	3	21	<i>very high to extremely high</i>
<i>Western Domain 4 (#38-4-0999)</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Western Domain 5 wet soak (#38-4-0993)</i>	5	5	5	5	5	5	30	<i>extremely high</i>

Table 6.1A - ADTOAC and ATOAC Aboriginal Archaeological Site Significance (cont)

Site Name	Ceremonial/ Spiritual/ Dreaming Connection	Rarity	Inter- relatedness	Teaching Potential	Aesthetics of Site	Outlook	Total	Cultural Significance Assessment
<i>Western Domain 6 (#38-4-1000)</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Western Domain 7 (#38-4-1001)</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Western Domain 8 (#38-4-1002)</i>	4	5	5	5	4	4	27	<i>very high to extremely high</i>
<i>Western Domain 9 (#38-4-1003)</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>#38-4-0098 AS</i>	3	3	5	3	3	3	20	<i>very high</i>
<i>#38-4-0097 AS</i>	2	3	5	3	3	3	19	<i>very high</i>
<i>Cockle Creek SA1</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Diega Creek SA1</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Cockle Creek Rockshelter with Artefacts and PAD</i>	3	5	5	5	5	5	28	<i>extremely high</i>
<i>Cockle Creek ST2</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Diega Creek ST1</i>	5	5	5	5	5	5	30	<i>extremely high</i>
<i>Diega Creek ST4</i>	3	5	5	5	5	5	28	<i>extremely high</i>

*** Please note that there is a highly significant feature in the area of the Brunkerville Trail AS1 site. It is not culturally appropriate for the nature or location of the feature to be disclosed in a public document. However, the general location of the feature will be disclosed to WWC and the DECCW in a separate document (ADTOAC 25 March 2010).

The Aboriginal cultural significance of the Aboriginal archaeological sites as presented by ADTOAC and ATOAC in **Table 6.1A** is based on the following criterion:

- **ceremonial/spiritual/Dreaming connection:** whether the site has ceremonial or spiritual connections and/or whether it has a Dreaming connection;
- **rarity:** whether site location and/or type, integrity, contents, and/or archaeological potential is common or rare within the local and/or regional context;
- **inter-relatedness:** whether the site location was thought to be related/connected to another site in the landscape;
- **teaching potential:** whether the site has a special potential for use to inform others of Awabakal history;
- **aesthetics:** whether the site is aesthetically pleasing in itself; and
- **outlook:** whether the site has an extensive outlook over Awabakal country and/or if the area of the site has an attractive perspective.

Each assessment criterion was ranked as follows:

- high = 1
- high to very high = 2
- very high = 3
- very high to extremely high = 4
- extremely high = 5.

In overall terms Aboriginal cultural significance was assessed by ADTOAC and ATOAC as follows:

- high = 1 to 6;
- high to very high = 7 to 13;
- very high = 14 to 20;
- very high to extremely high = 21 to 27; and
- extremely high = 28 to 35.

6.1.1.1 Summary Cultural Significance of Aboriginal Archaeological Sites

Overall it can be seen from **Table 6.1** and **Table 6.1A** that all of the Aboriginal archaeological sites had overall moderate or higher, up to exceedingly high, Aboriginal cultural significance. In summary:

- the stone arrangements had extremely high Aboriginal cultural significance;
- the grinding groove sites had from very high to extremely high Aboriginal cultural significance;

- the Cockle Creek Rockshelter with Artefacts and PAD had extremely high Aboriginal cultural significance;
- the scarred trees had very high to extremely high Aboriginal cultural significance;
- the Western Domain 5, Brunkerville Trail* and GNW artefact scatter sites had very high to extremely high Aboriginal cultural significance; and
- the remainder of the artefact scatters and isolated finds had moderate to very high Aboriginal cultural significance.

*It should be noted that high significance of the Brunkerville Trail Artefact Scatter site relates to its association with a landscape feature indentified by ADTOAC and ATOAC as having extremely high Aboriginal cultural significance. The nature and location of this feature will be disclosed to WWC and the DECCW but is not for public knowledge. The nature of the feature indicates that it will not be impacted by subsidence and any subsidence remediation in its proximity (if required) will be undertaken in consultation with the registered Aboriginal stakeholders and in compliance with the ACHMP.

At the final draft report stage the registered Aboriginal stakeholders were asked to comment on the appropriateness of combining and averaging the Aboriginal cultural significance assessments in order to be able to show this on a figure. ADTOAC (Shane Frost pers. com. 4 June 2010) and ATOAC (Dene Hawken and Kerrie Brauer pers. com. 1 June 2010) did not like the way in which this process was perceived to have diminished some of their significance rankings, however, were comfortable that the final results, as reflected within this summary, were accurate.

6.1.2 Landscape Features of Cultural Significance within the Proposed Continued Underground Mining Area

As noted in **Section 5.2** a number of landscape features were identified as being of cultural significance by the registered Aboriginal stakeholders involved in the survey. Please note that CCC (17 June 2010) requested its significance ranking be removed from **Table 6.2** (refer to **Appendix J**).

Table 6.2 - Aboriginal Cultural Significance of Landscape Features within the Proposed Continued Underground Mining Area

Feature	Aboriginal Cultural Significance	Overall Cultural Significance
Stone Arch	ADTOAC - <i>extremely high cultural significance</i> ADTOAC – <i>extremely high cultural significance</i> ALALC - <i>no comment</i> KLALC - <i>extremely high Aboriginal cultural significance</i>	Extremely high
Spring	ADTOAC - <i>extremely high cultural significance</i> ADTOAC – <i>extremely high cultural significance</i> ALALC - <i>highly significant</i> KLALC - <i>high Aboriginal cultural significance</i>	High to very high
Second 'Wet Soak'	ADTOAC - <i>extremely high cultural significance</i> ADTOAC – <i>extremely high cultural significance</i> ALALC - <i>highly significant</i> KLALC - <i>high Aboriginal cultural significance</i>	High to very high

Table 6.2 - Aboriginal Cultural Significance of Landscape Features within the Proposed Continued Underground Mining Area (cont)

Feature	Aboriginal Cultural Significance	Overall Cultural Significance
Pigment in Creek	ADTOAC - <i>extremely high cultural significance</i> ADTOAC – <i>extremely high cultural significance</i> ALALC - <i>culturally important</i> KLALC - <i>high Aboriginal cultural significance</i>	High to very high
Kangaroo Rock	ADTOAC - <i>extremely high cultural significance</i> ATOAC – <i>extremely high cultural significance</i> ALALC - <i>no comment</i> KLALC - <i>high Aboriginal cultural significance</i>	High to very high
Stone Cairns/Stacks	ADTOAC - <i>moderate to high cultural significance</i> ATOAC – <i>moderate to high cultural significance</i> ALALC - <i>no comment</i> KLALC – <i>no Aboriginal cultural significance</i>	Low to Moderate
Rockshelters 1 to 11	ADTOAC – <i>extremely high cultural significance</i> ATOAC – <i>extremely high cultural significance</i> ALALC- <i>cultural importance</i> CCC – <i>high Aboriginal cultural significance</i>	High to very high

ADTOAC and ATOAC used the same criterion for this assessment as presented in **Section 6.1.1**. The overall Aboriginal cultural significance of the landscape features was derived by combining and averaging the significance assessments.

6.1.2.1 Summary Cultural Significance of Landscape Features

In summary, the stone arch was assessed as having extremely high Aboriginal cultural significance, the remainder of the landscape features with the exception of the stone cairns/stacks were assessed as having high to very high Aboriginal cultural significance. The stone cairns/stacks were assessed by some groups as having no cultural significance, therefore, they were assessed as having only low to moderate significance overall.

At the final draft report stage the registered Aboriginal stakeholders were asked to comment on the appropriateness of combining and averaging the Aboriginal cultural significance assessments for the landscape features. ADTOAC (Shane Frost pers. com. 4 June 2010) and ATOAC (Dene Hawken and Kerrie Brauer pers. com. 1 June 2010) did not like the way in which this process was perceived to have diminished some of their significance rankings, however, were comfortable that the final results, as reflected within this summary, were accurate.

6.2 Archaeological Significance

6.2.1 Assessment Criteria

The archaeological significance of Aboriginal archaeological sites is primarily assessed according to their value to contribute to the archaeological/scientific understanding of Aboriginal culture (their research potential). Six criterion underlie the archaeological assessment process, being:

- **rarity:** whether site location and/or type, integrity, contents, and/or archaeological potential is common or rare within the local and regional context;
- **representativeness:** whether the site location and/or type, integrity, contents, and/or archaeological potential is common or uncommon within a local and regional context and whether sites of similar nature (or in better condition) are already set aside for conservation within the region;
- **integrity:** whether the site has the potential to contain subsurface archaeological material that has stratigraphic and/or spatial integrity;
- **connectedness:** whether the site is connected to sites in the local area or the region through chronology, site type, the use of an unusual raw material, knapping technique/reduction strategy, grinding technique and/or information provided by Aboriginal oral history, or has included within its boundary other site types (e.g. a grinding grove site with an associated rockshelter and surface artefact that are assumed to relate to the visit that resulted in the grinding groove);
- **complexity:** whether the site exhibits or is predicted to contain either a complex assemblage of stone artefacts in terms of artefact types and/or raw materials, artefacts of significance to understanding social interactions between Aboriginal groups, or features such as hearths or heat treatment pits, activity areas; or has included within its boundary other site types (e.g. a scarred tree/carved tree, grinding grooves, engravings etc. within an artefact scatter site); and
- **potential for archaeological deposit:** whether the site has the potential for artefactual material in a subsurface context. In this instance the artefactual material may or may not retain stratigraphic and/or spatial integrity, but has the potential by its investigation to provide information that would assist with gaining a greater understanding of the Aboriginal use of that part of the landscape or social interaction between Aboriginal groups.

Each assessment criterion is discussed below.

6.2.1.1 Rarity

The archaeological significance of a site is assessed as higher if it is perceived as unique or rare within the local area and/or within the region; conversely, the archaeological significance of a site is generally assessed as lower if it is perceived as common within the local area and/or within the region. Rarity may relate to the type of site, the age of the site, the location of the site in the landscape and its relationship to other sites, the preservation of the site (undisturbed sites are rare), or the nature of the site contents (it may contain artefact types, reduction strategies, grinding techniques that are unknown or not well represented in other sites; it may contain raw material types or mixes of raw material types or grinding grooves or mixes of grinding grooves that are not usually found in sites or are unusually informative of Aboriginal resource use in that area, it may contain hearths or other features rarely preserved in sites). It may form part of a site complex that is rare in the locality and/or region.

6.2.1.2 Representativeness

One of the aims of cultural heritage management is to ensure that a representative sample of sites is preserved for future generations. The objective is to preserve a sample of every type of site/site complex in the range of landscapes in which they occur to provide for future research that may have different research agendas than those of the contemporary Aboriginal and archaeological community. Thus sites/site types that are not currently known

to be represented by similar sites/site types within designated conservation areas where long-term conservation can be guaranteed, will have higher representativeness value than those known to be located in areas set aside for their long-term conservation.

6.2.1.3 Integrity

For a site to be able to contribute to an understanding of cultural sequences, it must contain distinguishable features or aspects that can be shown to have been created at different times within the context of that site or between sites. For such relationships to be possible the artefacts or features within the sites need to be located within a soil profile that retains integrity. The archaeological integrity or intactness of a site is important when assessing its significance and conservation value. A site that has been subject to minimal disturbance following the deposition of cultural materials contains considerably more information about environmental change and/or cultural sequences than a similar site that has been disturbed by natural process or human actions. Integrity of isolated find/Artefact scatter sites relates to the predicted stratigraphic and/or spatial integrity of the soil profile and the artefactual material it contains.

In the case of sites such as grinding grooves integrity relates to the state of preservation of the grinding grooves and whether the grooves can inform on chronological use of the site. Similarly with scarred trees integrity relates to the condition of the tree/scar and also the ability of the time of the bark removal (scarring) to inform us of the chronology of Aboriginal use of the landscape.

6.2.1.4 Connectedness

Connectedness refers to the relationship between sites within an area, and in its broadest sense refers to patterns linking sites within an area. Connectedness is often difficult to ascertain as the chronological sequence of use of surface sites is unknown at this stage of their assessment, and often cannot be determined through archaeological dating. Thus connectedness must be related to other features of sites and/or their assemblages. Sites may appear connected due to their location within the landscape (for example a series of sites associated with a terrain unit or landform element) or because of the nature of their assemblages (for example, the use of similar raw materials, reduction sequences, grinding techniques aimed at producing similar implement types) or the nature of features within the sites (for example heat treatment pits, hearths, knapping floors).

In some cases, it may be that a series of sites within an area relates to a number of different activities which are in fact all components of a single land use system (for example, a stone quarry, a camp site at which reduction of that stone takes place, a sandstone outcrop on which that stone is ground; or an artefact scatter site that has within its confines a scarred tree or a set of grinding grooves that can be assumed to relate to at least one of the visits that resulted in the artefact scatter). As mentioned above, the difficulty with assessing such an aspect of connectedness arises in demonstrating that all of the sites/aspects of the site relate to the same period of time.

While it is broadly possible to assign some site types to limited time periods (e.g. scarred trees can have only a finite life and thus are unlikely to be more than 300 to 400 years old) and/or some artefact types to limited time periods (backed blades, Bondi points, eloueras, edge ground axes), these time periods still span thousands of years and the artefacts in question generally only represent a minor component of most assemblages and thus their presence cannot be used to make statements about the majority of the artefacts within any assemblage. Thus, the use of 'artefact types' to date surface assemblages remains too broad (e.g. 4000 to 7000 years) to be useful in discussing the operation of a pattern of land use at any given time and to make judgements related to connectedness. However, it is

deemed appropriate to suggest 'connectedness' in relation to grinding groove sites as they all have a similar function (e.g. grinding of stone, bone or wooden implements).

6.2.1.5 Complexity

The complexity of a site is an indication of its ability to contribute information on the local Aboriginal culture. The complexity of a site may be indicated by the number and/or density of stone artefacts it contains, or by the range of raw materials, knapping methods, reduction strategies and/or features, or other site types that occur within it. Features that may occur within a site include knapping floors, heat treatment pits, hearths or other items that do not fall within the description of a generalised scatter of flaked stone artefacts. Other associated site types such as scarred trees, carved trees, grinding grooves, engravings etc. can also increase the complexity of a site.

In relation to the grinding groove sites, complexity will be assessed based on the number of different groove types within the site and/or the number of grooves in the site.

6.2.1.6 Potential for Archaeological Deposit

For this assessment potential for archaeological deposit refers to sites that may or may not retain stratigraphic or spatial integrity but which are predicted to contain artefacts in a subsurface context that may by their controlled salvage and analysis add to the knowledge of Aboriginal use of the landscape/resource base of an area in a more general sense. In relation to the grinding groove sites this criterion includes the potential for the site to have an associated deposit that may contain material flaked from axes during the grinding/resharpening process as petrological and/or geochemical analysis of those flakes could be used to answer questions related to social interaction between the Awabakal and their neighbours.

6.2.1.7 Evaluation of Criteria

Past studies by Umwelt (2004a, 2004b, 2009c) within the Singleton/Muswellbrook area and in other parts of NSW (Umwelt 2007), have developed a standardised approach to the evaluation of archaeological significance, involving the use of numerical values for each significance criterion so that an overall archaeological significance assessment can be quantified. **Table 6.3** outlines the basis for numerical values attributed to each criteria set, which are as follows:

- low significance was afforded a score of 1;
- moderate significance was afforded a score of 2; and
- high significance was afforded a score of 3.

Overall significance was scored as follows:

- low significance 12-15;
- low to moderate significance 16-19;
- moderate significance 20-23;
- moderate to high significance 24-27; and
- high significance >27.

Table 6.3 - Criteria Used in Evaluating Archaeological Significance

	Low (Score of 1)	Moderate (Score of 2)	High (Score of 3)
Rarity	The location of the site within the landscape, its type, integrity, contents, features, associations with other site types and/or potential for subsurface artefacts, are common within the local and regional context.	The location of the site within the landscape, its type, integrity, contents features, associations with other site types and/or potential for subsurface artefacts, are common within the regional context but not the local context.	The location of the site within the landscape, its type, integrity, contents features, associations with other site types and/or potential for subsurface artefacts, are rare within the local and regional context.
Representative-ness	The site, when viewed in relation to its type, contents, integrity, features, associations with other site types and/or potential for subsurface artefacts and location in the landscape, is common within a local and regional context and sites of similar nature (or in better condition) are already set aside for long-term conservation within the region.	The site, when viewed in relation to its type, contents, integrity, features, associations with other site types and/or potential for subsurface artefacts and location in the landscape, is uncommon within a local context but common in a regional context and sites of similar nature (or in better condition) are already set aside for long-term conservation within the region.	The site, when viewed in relation to its type, contents, integrity, features, associations with other site types and/or potential for subsurface artefacts and location in the landscape, is uncommon within a local and regional context and sites of similar nature (or in better condition) are not already set aside for long-term conservation within the locality or region.
Integrity	Stratigraphic integrity of the site has clearly been destroyed due to major disturbance/loss of topsoil. The level of disturbance is likely to have removed all spatial and chronological information. In the case of grinding grooves or scarred trees they are in poor condition/dead.	The site appears to have been subject to moderate levels of disturbance, however, there is a moderate possibility that useful spatial information can still be obtained from subsurface investigation of the site, even if it is unlikely that any useful chronological evidence survives. In the case of grinding grooves or scarred trees they are in fair condition.	The site appears relatively undisturbed and there is a high possibility that useful spatial information can still be obtained from subsurface investigation of the site, even if it is still unlikely that any useful chronological evidence survives. In the case of grinding grooves or scarred trees they are in good condition

Table 6.3 - Criteria Used in Evaluating Archaeological Significance (cont)

	Low (Score of 1)	Moderate (Score of 2)	High (Score of 3)
Connectedness	There is no evidence to suggest that the site is connected to other sites in the local area or the region through: • their chronology (rarely known); • their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction and/or sites within sites e.g. a scarred tree within an artefact scatter); • by the use of an unusual raw material, knapping technique/reduction strategy; • similar designs/motifs in the case of art sites and engravings; and/or • information provided by Aboriginal oral history.	There is some evidence to suggest that the site is connected to other sites in the local area or the region through one of the following: • their chronology (rarely known); • their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction and/or sites within sites e.g. a scarred tree within an artefact scatter); • by the use of an unusual raw material, knapping technique/reduction strategy; • similar designs/motifs in the case of art sites and engravings; or • information provided by Aboriginal oral history.	There is good evidence to support the theory that the site is connected to other sites in the local area or the region through two or more of the following: • their chronology (rarely known); • their site type (e.g. connectedness could be argued between an axe quarry, a nearby set of axe grinding grooves and an adjacent site exhibiting evidence of axe reduction and/or sites within sites e.g. a scarred tree within an artefact scatter); • by the use of an unusual raw material, knapping technique/reduction strategy; • similar designs/motifs in the case of art sites and engravings; and/or • information provided by Aboriginal oral history.

Table 6.3 - Criteria Used in Evaluating Archaeological Significance (cont)

	Low (Score of 1)	Moderate (Score of 2)	High (Score of 3)
Complexity	The site does not exhibit and is not predicted to contain any of the following in a subsurface context: - a complex assemblage of stone artefacts in terms of artefact types and/or raw materials (including use of local and imported raw materials) and/or knapping techniques/reduction strategies; - features such as hearths or heat treatment pits, activity areas; and/or - the site does not contain a site within a site e.g. a scarred tree within an artefact scatter. In relation to grinding grooves the site reflects only one type of grinding groove and a small number of grooves In relation to a scarred tree the tree has a scar/scars that is/are of a common type in the locality/region.	The site exhibits or can be predicted to contain one of the following in a subsurface context: - a complex assemblage of stone artefacts in terms of artefact types and/or raw materials and/or knapping techniques/reduction strategies and/or use of local and imported raw materials; - features such as hearths or heat treatment pits, activity areas; and/or - the site contains a site within a site e.g. a scarred tree within an artefact scatter. In relation to grinding grooves the site reflects two types of grinding groove and/or a >10 - <20 grooves In relation to a scarred tree the tree has a scar/scars that is/are of not a common type in the locality, but are common in the region.	The site exhibits or can be predicted to contain a of the following in a subsurface context: - a complex assemblage of stone artefacts in terms of artefact types and/or raw materials and/or knapping techniques/reduction strategies and/or use of local and imported raw materials; and - features such as hearths or heat treatment pits, activity areas; and/or - the site contains more than one site within a site e.g. a number of scarred trees and/or a more than two site types e.g. a set of grinding grooves and a scarred tree within an artefact scatter. In relation to grinding grooves the site reflects more than two types of grinding groove and/or >20 grooves. In relation to a scarred tree the tree has a scar/scars that is/are of not a common type in the locality/region.
Potential for Archaeological Deposit	The site does not have, or has only a low potential to contain subsurface archaeological material that may by its controlled excavation and analysis assist with answering questions of contemporary archaeological interest (including social interaction) or that indicate it should be preserved for its future research potential.	The site has a moderate potential to contain subsurface archaeological material that may by its controlled excavation and analysis assist with answering questions of contemporary archaeological interest (including social interaction) or that indicate it should be preserved for its future research potential.	The site has a high potential to contain subsurface archaeological material that may by its controlled excavation and analysis assist with answering questions of contemporary archaeological interest or (including social interaction) that indicate it should be preserved for its future research potential.

Local significance was ranked based on information known about the individual site and in relation to other sites (of the same type/within the same landscape location) known from the local area (Sugarloaf Range area) and regional significance was based on a comparison with other sites known from the broader Newcastle/Lake Macquarie/lower Hunter Valley region.

Based on the discussion provided in **Table 6.3** each of the sites located within the proposed continued underground mining area has been assessed for its archaeological significance. **Table 6.4** indicates the numerical values attributed to each Aboriginal archaeological site for each archaeological assessment criterion. Sites assessed for their archaeological significance in **Table 6.4** are shown on **Figure 6.2**. Within the figure the sites are colour coded to indicate their assessed level of archaeological significance. Sites shown in *italics* in **Table 6.4** are outside the proposed continued underground mining area.

Landscape features of cultural significance identified in **Sections 5.2** and **6.1** are not assessed for archaeological significance as these locations do not have any archaeological evidence of occupation/use and are therefore not able to be ranked according to archaeological criteria. This, however, does not diminish the Aboriginal cultural heritage value/significance of these landscape features in any way.

Table 6.5 groups the sites by site type and their assessed archaeological significance. The table includes the 49 newly recorded sites and the 13 previously recorded sites (with AHIMS numbers) that are within the proposed continued underground mining area or its proximity. The sites that are outside the proposed continued underground mining area are shown in *italics* in **Table 6.5**.

Table 6.5 indicates that based on the criteria set out in **Table 6.4**:

- thirty three isolated finds and artefact scatters were assessed as having low overall archaeological significance (53% of the assessed sites);
- seven grinding groove sites and three artefact scatters were assessed as having overall low to moderate archaeological significance (16% of the assessed sites);
- two grinding groove sites and three scarred trees were assessed as having overall moderate archaeological significance (8% of the assessed sites);
- five grinding groove sites and two stone arrangements were assessed as having overall moderate to high archaeological significance (11% of the assessed sites); and
- six grinding groove sites (including #38-4-0462 Grinding Grooves and Associated Rockshelter site) and one rockshelter with artefacts and PAD were assessed as having overall high archaeological significance (11% of the assessed sites).

High levels of prior disturbance and erosion (related mainly to historic impacts by logging practices including track construction, maintenance and use) are the main factors that led to the high percentage of the artefact scatter and isolated find sites that were assessed as having low overall archaeological significance.

Table 6.4 – Archaeological Significance Assessment

Site Name	Rarity		Represent- ativeness		Archaeological Integrity		Connectedness		Complexity		Potential for Archaeological Deposit		Overall Archaeological Significance	
	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional		
Bangalow Creek GG1	3	3	3	3	3	2	3	3	2	1	2	1	29	high
Bangalow Creek GG2	3	3	3	3	2	1	3	3	1	1	3	1	27	moderate to high
Bangalow Creek GG3	3	3	3	3	2	1	3	3	2	1	2	1	27	moderate to high
Bangalow Creek GG4	3	3	3	3	2	1	3	3	2	1	1	1	26	moderate to high
Bangalow Creek GG5	3	3	3	3	2	1	3	3	3	3	1	1	29	high
Bangalow Creek GG6	3	3	3	3	2	1	3	3	1	1	1	1	25	moderate to high
Bangalow Creek GG7	3	3	3	3	2	1	3	3	1	1	1	1	25	moderate to high
#38-4-0461	2	2	2	2	2	1	2	2	2	1	1	1	20	moderate
#38-4-0462 Grinding Grooves and Associated Rockshelter	3	3	3	3	2	1	3	3	3	3	1	1	29	high
Cockle Creek Grinding Grooves 1	2	2	2	2	2	1	2	2	1	1	1	1	19	low to moderate
Cockle Creek Grinding Grooves 2	2	2	2	2	2	1	2	2	1	1	1	1	19	low to moderate
Diega Creek Grinding Grooves 1	2	3	2	3	2	1	2	2	2	1	1	1	22	moderate
Diega Creek Grinding Grooves 2	2	2	2	2	1	1	2	2	1	1	1	1	18	low to moderate
Diega Creek Grinding Grooves 3	2	2	2	2	1	1	2	2	1	1	1	1	18	low to moderate
Diega Creek Grinding Grooves 4	2	2	2	2	1	1	2	2	2	1	1	1	19	low to moderate
Diega Creek Grinding Grooves 5	2	2	2	2	2	1	2	2	1	1	1	1	19	low to moderate

Table 6.4 – Archaeological Significance Assessment (cont)

Site Name	Rarity		Represent- ativeness		Archaeological Integrity		Connectedness		Complexity		Potential for Archaeological Deposit		Overall Archaeological Significance	
	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional		
Diega Creek Grinding Grooves 6	2	2	2	2	1	1	2	2	1	1	1	1	18	low to moderate
#38-4-1007 (Palmers Creek 1 Grinding Grooves)	3	3	2	2	3	2	3	3	3	2	1	1	28	high
Palmers Creek Grinding Groove 2	3	3	2	2	2	1	3	3	3	3	3	2	30	high
Palmers Creek Grinding Groove 3	3	3	2	2	3	2	3	3	3	3	1	1	29	high
Bangalow Creek AS1	1	1	2	1	1	1	1	1	1	1	1	1	13	low
<i>Bangalow Creek AS2</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
<i>Boggy Hole Creek AS1</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
Boggy Hole Creek IF1	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Brunkerville Trail AS1	3	1	3	1	1	1	1	1	2	1	1	1	17	low to moderate
Cockle Creek AS1	1	1	2	1	1	1	1	1	1	1	1	1	13	low
<i>Cockle Creek AS2</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
<i>Cockle Creek AS3</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>14</i>	<i>low</i>
<i>Cockle Creek AS4</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
Cockle Creek AS5	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Cockle Creek AS6	1	1	2	1	1	1	1	1	1	1	1	1	13	low
<i>Cockle Creek IF1</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
<i>Cockle Creek IF2</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>13</i>	<i>low</i>
Cockle Creek IF3	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Cockle Creek IF4	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek AS1	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek AS2	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek AS3	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek IF1	1	1	2	1	1	1	1	1	1	1	1	1	13	low

Table 6.4 – Archaeological Significance Assessment (cont)

Site Name	Rarity		Represent- ativeness		Archaeological Integrity		Connectedness		Complexity		Potential for Archaeological Deposit		Overall Archaeological Significance	
	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional	Local	Regional		
Diega Creek IF2	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek IF3	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek IF4	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek IF5	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Diega Creek IF6	1	1	2	1	1	1	1	1	1	1	1	1	13	low
#38-4-0995 GNW1	3	1	3	1	1	1	1	1	2	1	1	1	17	low to moderate
Western Domain 1 (#38-4-0996)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 2 (#38-4-0997)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 3 (#38-4-0998)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 4 (#38-4-0999)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 5 (#38-4-0993)	3	2	3	2	2	1	1	1	1	1	2	1	18	low to moderate
Western Domain 6 (#38-4-1000)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 7 (#38-4-1001)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Western Domain 8 (#38-4-1002)	2	1	2	1	1	1	1	1	2	1	1	1	15	low
Western Domain 9 (#38-4-1003)	1	1	2	1	1	1	1	1	1	1	1	1	13	low
#38-4-0098	1	1	2	1	1	1	1	1	1	1	1	1	13	low
#38-4-0097	1	1	2	1	1	1	1	1	1	1	1	1	13	low
Cockle Creek SA1	3	3	3	3	2	2	1	1	3	2	1	1	25	moderate to high
Diega Creek SA1	3	3	3	3	3	3	1	1	2	1	1	1	25	moderate to high

Table 6.4 – Archaeological Significance Assessment (cont)

Site Name	Rarity		Represent- ativeness		Archaeological Integrity		Connectedness		Complexity		Potential for Archaeological Deposit		Overall Archaeological Significance	
	<i>Local</i>	<i>Regional</i>	<i>Local</i>	<i>Regional</i>	<i>Local</i>	<i>Regional</i>	<i>Local</i>	<i>Regional</i>	<i>Local</i>	<i>Regional</i>	<i>Local</i>	<i>Regional</i>		
Cockle Creek Rockshelter with Artefacts and PAD	3	3	3	3	2	1	1	1	3	3	3	3	29	high
Cockle Creek ST2	3	2	3	2	3	2	1	1	1	1	1	1	21	moderate
Diega Creek ST1	3	2	3	2	3	2	1	1	1	1	1	1	21	moderate
Diega Creek ST4	3	2	3	2	2	1	1	1	2	1	1	1	21	moderate

Overall Significance:

Low 12-15

Low to Mod 16-19

Mod 20-23

Mod to High 24-27

High >27

Table 6.5 - Summary of Archaeological Site Significance

Site Type	Low	Low to Moderate	Moderate	Moderate to High	High	Total
Grinding Groove Sites		Cockle Creek GG1 <i>Cockle Creek GG2</i> Diega Creek GG2 Diega Creek GG3 Diega Creek GG4 Diega Creek GG5 Diega Creek GG6	Diega Creek GG1 #38-4-0461	Bangalow Creek GG2 Bangalow Creek GG3 Bangalow Creek GG4 Bangalow Creek GG6 Bangalow Creek GG7	Bangalow Creek GG1 Bangalow Creek GG5 #38-4-0462 <i>Grinding Grooves and Associated Rockshelter,</i> #38-4-1007 - Palmers Creek G1 Palmers Creek GG2 Palmers Creek GG3	20
Artefact Scatters and Isolated Finds	Bangalow Creek AS1, Bangalow Creek AS2 <i>Boggy Hole Creek AS1, Boggy Hole Creek IF1</i> Cockle Creek AS1, <i>Cockle Creek AS2</i> <i>Cockle Creek AS3, Cockle Creek AS4</i> Cockle Creek AS5, Cockle Creek AS6 <i>Cockle Creek IF1, Cockle Creek IF2</i> Cockle Creek IF3, Cockle Creek IF4 Diega Creek AS1, Diega Creek AS2, Diega Creek AS3, Diega Creek IF1, Diega Creek IF2, Diega Creek IF3, Diega Creek IF4, Diega Creek IF5, Diega Creek IF6 Western Domain 1 (#38-4-0996) Western Domain 2 (#38-4-0997) Western Domain 3 (#38-4-0998) <i>Western Domain 4 (#38-4-0999)</i> Western Domain 6 (#38-4-1000)	#38-4-0995 GNW1 Brunkerville Trail AS1 #38-4-0993 - Western Domain 5				36

Table 6.5 - Summary of Archaeological Site Significance (cont)

Site Type	Low	Low to Moderate	Moderate	Moderate to High	High	Total
Artefact Scatters and Isolated Finds (cont)	Western Domain 7 (#38-4-1001) Western Domain 8 (#38-4-1002) Western Domain 9 (#38-4-1003) #38-4-0098, #38-4-0097					
Rockshelter with Artefacts and PAD					Cockle Creek Rockshelter with Artefacts and PAD	1
Stone Arrangements				Cockle Creek SA1 Diega Creek SA1		2
Scarred Trees			Cockle Creek ST2 Diega Creek ST1 Diega Creek ST4			3
Total	33	10	5	7	7	62

6.2.2 Sites of High Archaeological Significance

This section provides the rationale for the assessment of high archaeological significance. A total of seven sites were assessed as having high archaeological significance: seven grinding groove sites (Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5, #38-4-0462 Grinding Grooves and Associated Rockshelter, Palmers Creek Grinding Grooves 1 (#38-4-1007), Palmers Creek Grinding Grooves 2 and Palmers Creek Grinding Grooves 3) and the Cockle Creek Rockshelter with Artefacts and PAD. The high archaeological significance ranking was due to a combination of the following:

- in relation to Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5, and #38-4-0462 Grinding Grooves and Associated Rockshelter, the rarity of clusters of sets of grinding grooves in the locality and region (only one other similar cluster is known in the Sugarloaf Range and SSCA in the upper catchment of Surveyors Creek, however, this cluster does not include a rockshelter - no other similar clusters are currently known within the lower Hunter region);
- in relation to Bangalow Creek Grinding Grooves 5, Palmers Creek Grinding Grooves 1 (#38-4-1007) and Palmers Creek Grinding Grooves 3, the rarity of grinding groove sites with such high numbers of grooves representing a predicted high number of hours and multiple visits to produce within the lower Hunter region;
- in relation to the #38-4-0462 Grinding Grooves and Associated Rockshelter site, the rarity of grinding groove sites associated with rockshelters in the locality and region (there are no others known in the Sugarloaf Range area and only one similar site known in the lower Hunter region);
- in relation to the Cockle Creek Rockshelter with Artefacts and PAD the rarity of rockshelters with evidence of Aboriginal occupation in the locality and region (only one other site known in the Sugarloaf Range, none in the SSCA and only low numbers are registered in the lower Hunter region);
- in relation to Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5 and #38-4-0462 Grinding Grooves and Associated Rockshelter, the representativeness of clusters of sets of grinding grooves in the locality and region - (only one other similar cluster of grinding grooves is known in the Sugarloaf Range and the SSCA in the upper catchment of Surveyors Creek. however, this cluster does not include a rockshelter. This cluster of sites is located within the Tasman ML. The sites are currently not approved for impact but future proposals for impact are not precluded by their location within the SSCA. There are no other grinding groove clusters known within the lower Hunter region that are in long term conservation);
- in relation to the #38-4-0462 Grinding Grooves and Associated Rockshelter site, the representativeness of grinding groove sites associated with rockshelters in the locality and region (there are no other similar sites known in the Sugarloaf Range area or the SSCA and only one similar site known in the lower Hunter region. This site is in the Newstan ML and is not in long-term conservation);
- in relation to the Cockle Creek Rockshelter with Artefacts and PAD, the representativeness of rockshelters with evidence of Aboriginal occupation in the locality and region (only one other rockshelter site with PAD is known in the Sugarloaf Range and this is not within the SSCA). There are sites known within the broader region but only those within the Watagans National Park approximately 14 kilometres to the south-west are being conserved);

- in relation to the Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5, #38-4-0462 Grinding Grooves and Associated Rockshelter, Palmers Creek Grinding Grooves 1 (#38-4-1007), Palmers Creek Grinding Grooves 2 and Palmers Creek Grinding Grooves 3, the high integrity of the grooves;
- in relation to the Cockle Creek Rockshelter with Artefacts and PAD, the high integrity of the rockshelter deposit;
- in relation to the Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5, #38-4-0462 Grinding Grooves and Associated Rockshelter, Palmers Creek Grinding Grooves 1 (#38-4-1007), Palmers Creek Grinding Grooves 2 and Palmers Creek Grinding Grooves 3, the assessed connectedness of the grinding groove sites;
- in relation to the Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5, #38-4-0462 Grinding Grooves and Associated Rockshelter, Palmers Creek Grinding Grooves 1 (#38-4-1007), Palmers Creek Grinding Grooves 2 and Palmers Creek Grinding Grooves 3, the complexity of the grooves and in the case of #38-4-0462 the further complexity afforded by the associated rockshelter with artefact;
- in relation to the Cockle Creek Rockshelter site with Artefacts and PAD, the complexity of the site which was a place of occupation, has surface artefacts and the potential for subsurface artefacts and possibly hearths in a stratified, datable context; and
- the potential for areas of low gradient associated with the Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 5 and Palmers Creek Grinding Grooves 2 sites to have artefacts in a subsurface context which through their excavation and petrological and/or geochemical analysis could provide information on Awabakal social interaction.

6.2.3 Sites of Moderate to High Archaeological Significance

This section provides the rationale for the assessment of moderate to high archaeological significance. A total of seven sites were assessed as having moderate to high archaeological significance. Five grinding groove sites – Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 6, Bangalow Creek Grinding Grooves 7 and Cockle Creek Stone Arrangement 1 and Diega Creek Stone Arrangement 1. The moderate to high archaeological significance ranking was due to a combination of the following:

- in relation to Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 6, Bangalow Creek Grinding Grooves 7 sites, the rarity of clusters of sets of grinding grooves in the locality and region (only one other similar cluster is known in the Sugarloaf Range in the upper catchment of Surveyors Creek and no others are currently known within the lower Hunter region);
- in relation to the Cockle Creek Stone Arrangement 1 and Diega Creek Stone Arrangement 1, the rarity of stone arrangements located within the region and the rarity of so many stone arrangements in one locality (there are already four registered stone arrangements known within the Sugarloaf Range area). Only two other stone arrangement sites are known for the lower Hunter region and these are one circular arrangement (that appears to have been destroyed by development) and a site consisting of three separate arrangements, a stone circle, a semi-circle and a stone cairn, all which were avoided during construction of the F3 Freeway;

- in relation to Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 6, the SSCA sites, the representativeness of clusters of grinding grooves in the locality and region - (only one other similar cluster of grinding grooves is known in the Sugarloaf Range in the upper catchment of Surveyors Creek. This cluster of sites is located within the SSCA but within the Tasman ML. The sites are currently not approved for impact but future proposals for impact are not precluded by their location within the SSCA. There are no other grinding groove clusters known within the lower Hunter region that are in long term conservation);
- in relation to the Cockle Creek Stone Arrangement 1 and Diega Creek Stone Arrangement 1 sites, the representativeness of the stone arrangement in the locality (representative of a rare cluster of stone arrangement sites) and region (there are no similar stone arrangements that are in long-term conservation);
- in relation to Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 6, Bangalow Creek Grinding Grooves 7 sites, the degree of integrity of the grooves (more variable than those afforded high significance);
- in relation to the Diega Creek Stone Arrangement 1 site, the high integrity of the stone arrangement;
- in relation to Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 6, Bangalow Creek Grinding Grooves 7 sites, the assessed connectedness of the grinding groove sites; and/or
- in relation to the Bangalow Creek Grinding Grooves 5 site, the degree of complexity of the grooves;
- in relation to the Cockle Creek Stone Arrangement 1 and Diega Creek Stone Arrangement 1 sites, the degree of complexity of the construction of the stone arrangements;
- in relation to Bangalow Creek Grinding Grooves 2 and Bangalow Creek Grinding Grooves 3 sites, the potential for areas of low gradient associated with the grooves to have artefacts in a subsurface context which through their excavation and petrological and/or geochemical analysis could provide information on Awabakal social interaction; and
- the lack of an area of PAD associated with the Diega Creek Stone Arrangement 1 site (the stone arrangement would have ranked as having high archaeological significance if it had associated PAD or even surface artefacts).

6.2.4 Sites of Moderate Archaeological Significance

This section provides the rationale for the assessment of moderate archaeological significance. A total of five sites were assessed as having moderate archaeological significance: two grinding groove sites (#38-4-0461 and Diega Creek Grinding Grooves 1); and the three scarred trees (Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4). The moderate archaeological significance ranking was due to a combination of the following:

- the lesser rarity of grinding groove sites that are not in clusters in the locality and region;
- in relation to the Diega Creek Grinding Grooves 1 site, the moderately high number of grooves and the high number of hours predicted that have been spent in grinding at the site;
- the rarity of scarred trees in the locality and region;
- the lesser representativeness value of grinding groove sites that are not in clusters;
- the representativeness scarred trees - none of which are currently known to be in conservation in the locality and region;
- the degree of integrity of the grooves (lower than those afforded higher significance);
- the degree of integrity of the scarred trees;
- the assessed connectedness of the grinding groove sites;
- the degree of complexity of the grooves (less than those afforded higher significance);
- the number of scars on the trees; and
- the lack surface artefacts or PAD in association with the sites.

6.2.5 Sites of Low to Moderate Archaeological Significance

This section provides the rationale for the assessment of low to moderate archaeological significance. A total of 10 sites were assessed as having low to moderate archaeological significance. Seven grinding groove sites (Cockle Creek Grinding Grooves 1, *Cockle Creek Grinding Grooves 2*, Diega Creek Grinding Grooves 2, Diega Creek Grinding Grooves 3, Diega Creek Grinding Grooves 4, Diega Creek Grinding Grooves 5 and Diega Creek Grinding Grooves 6) and three artefact scatters – #38-4-0995 GNW1, Brunkerville Trail AS1, #38-4-0993 Western Domain 5. The low to moderate archaeological significance ranking was due to a combination of the following:

For the grinding groove sites:

- the lesser rarity of grinding groove sites that are not in clusters in the locality and region;
- the lesser representativeness value of grinding groove sites that are not in clusters;
- the degree of integrity of the grooves (lower than those afforded higher significance);
- the degree of complexity of the grooves (less than those afforded higher significance);
- the low number of grooves; and
- the lack of an area of PAD or surface artefacts in association with the sites.

For the #38-4-0995 and GNW1 and Brunkerville Trail 1 artefact scatters:

- the rarity of artefact scatters with more than 20 artefacts in the locality but not the region;
- the representativeness of artefact scatters with more than 20 artefacts in the locality but not the region; and

- the potential for relatively high numbers of subsurface artefacts in areas adjoining the artefact exposures.

For the #38-4-0993 Western Domain 5 artefact scatter:

- the rarity of an artefact scatter associated with a wet soak;
- the representativeness of an artefact scatter associated with a wet soak;
- the integrity of the wet soak feature;
- the added complexity of the wet soak artefact combination; and
- the potential for further subsurface artefacts in areas adjoining the wet soak.

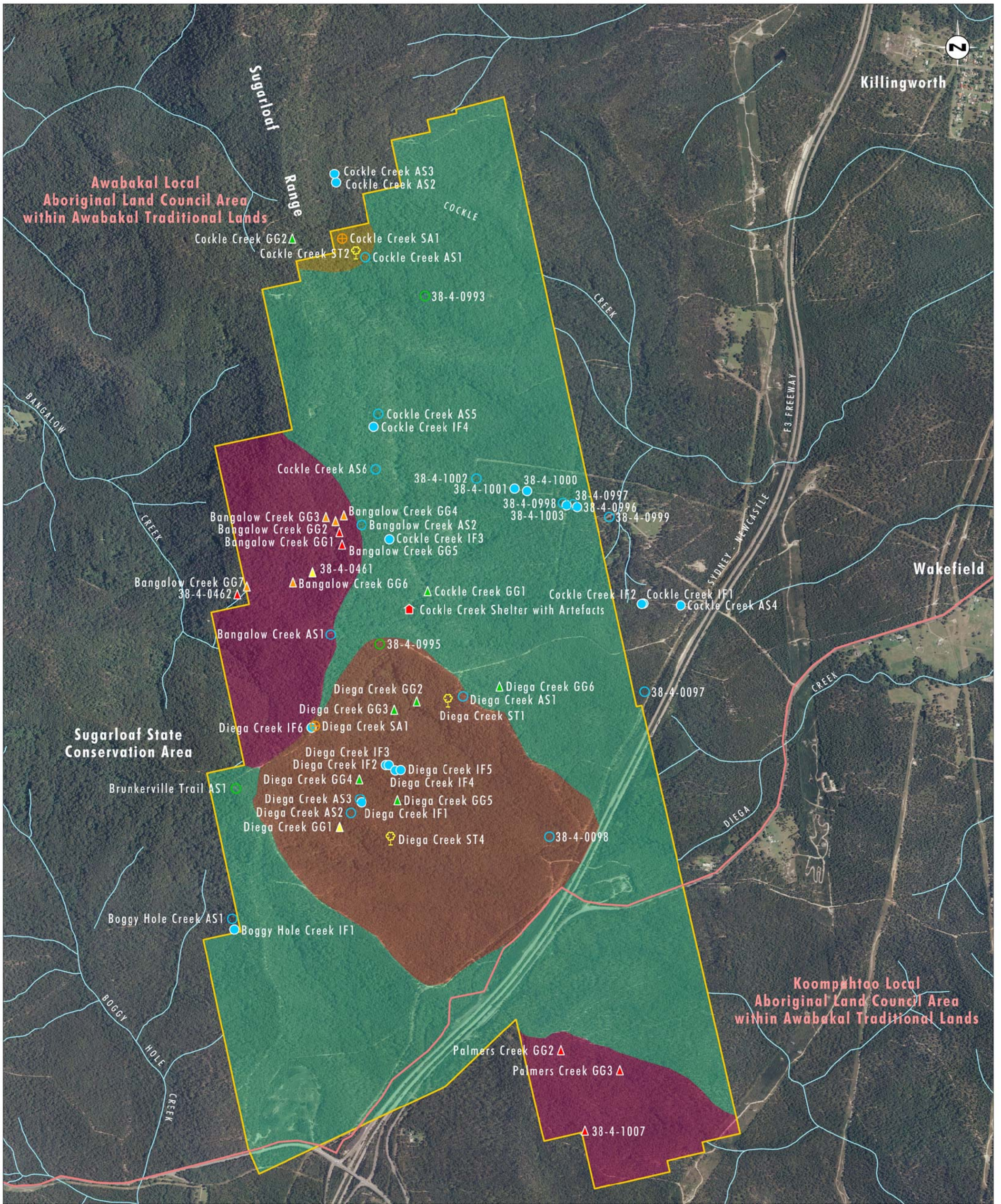
6.2.6 Sites of Low Archaeological Significance

This section provides the rationale for the assessment of low archaeological significance. A total of 33 sites, all artefact scatters and isolated finds, were assessed as having low archaeological significance (refer to **Table 6.4** for site names). The low archaeological significance ranking was due to a combination of the following:

- small artefact scatters and isolated finds are common site types in the locality and region, and are not considered rare;
- small artefact scatters and isolated finds are common site types in the locality and region, with numerous similar sites located outside the proposed continued underground mining area in similar landscape contexts, however, none of these are currently being managed for their long-term conservation; therefore, they are considered moderately representative;
- integrity of the sites is very low, with all sites recorded in areas of disturbance resulting from human action (logging and track construction, use, maintenance) and/or geomorphic processes (erosion). These processes have resulted in sites with no potential for stratigraphic integrity or spatial integrity;
- there is no evidence for connectedness amongst the sites, as recorded archaeological features do not directly link any sites; and
- the sites are predicted as likely to have only extremely low, to low density and low complexity subsurface assemblages in disturbed contexts and thus do not retain potential archaeological deposits with archaeological research value.

6.2.7 Archaeological Significance of the Landforms

As noted in **Section 5.6** it is assessed that the survey identified a representative sample of the site types that can be expected within each of the landforms within the proposed continued underground mining area. **Figure 6.3** shows the sites colour-coded for their assessed archaeological significance overlain on a base showing the landform elements within the proposed continued underground mining area.



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- LALC Boundary
- Drainage Line
- Artefact Scatter
- Isolated Find
- Axe Grinding Groove
- Shelter with Deposit
- Stone Arrangement
- Scarred Tree

- Site Significance Level:
- High
 - Moderate-High
 - Moderate
 - Low-Moderate
 - Low

- Landform Significance Level:
- High
 - Moderate-High
 - Moderate
 - Low-Moderate

FIGURE 6.3
Archaeological
Landform Significance

From **Figure 6.3** it can be noted that:

- the sites of high significance are located in two areas:
 - the upper catchment of Palmers Creek in the far south of the proposed continued underground mining area; and
 - the upper catchment of Bangalow Creek from the Sugarloaf Range Ridgeline to the western boundary of the proposed continued underground mining area;
- the sites of moderate to high significance are located in three areas:
 - the upper catchment of Bangalow Creek near the western boundary of the proposed continued underground mining area;
 - the upper catchment of Cockle Creek in the far north of the proposed continued underground mining area; and
 - the upper catchment of Diega Creek slightly to the south of the centre of the proposed continued underground mining area.
- the remainder of the sites of low and low to moderate significance are spread throughout the proposed continued underground mining area;
- based on the results of the survey and site analysis the following landforms have been given high archaeological significance (refer to **Figure 6.3**):
 - the upper catchment of Bangalow Creek from the Sugarloaf Range Ridgeline to the western boundary of the proposed continued underground mining area incorporating part of proposed Longwall 49 and 48; and
 - the upper catchment of Palmers Creek including the chain pillar separating Longwall 45 and 46, then to the west and incorporating the section of Longwall 44 now removed from the mine plan;
- based on the results of the survey and site analysis the following landforms have been given moderate to high archaeological significance (refer to **Figure 6.3**):
 - the upper catchment of Diega Creek;
- based on the results of the survey the following landform has been given moderate archaeological significance (refer to **Figure 6.3**):
 - the upper catchment of Cockle Creek to the north of Longwall 42 and outside the proposed continued underground mining area;
 - the remainder of the landform elements within the proposed continued underground mining area are assessed as having overall low to moderate archaeological significance.

6.2.8 Archaeological Research Potential (Sites)

The research potential of a site is assessed on the basis of the potential for the site, through further investigation, to add significantly to our understanding of the Aboriginal past. As limited archaeological investigation has been undertaken within sites in the Sugarloaf Range area all new information gathered from site investigation is adding significantly to what is currently known about the Aboriginal use of the area. Thus there are no sites within the proposed continued underground mining area that can be assessed as having no archaeological research potential.

A number of factors contribute to the assessment of archaeological research potential, including the complexity of the site, how well preserved the site is, how the site relates to prevailing research themes, and whether the site is able to provide information that is not otherwise available. As such, this assessment draws heavily from the preceding assessments, but does not form part of the initial significance ranking process.

The Cockle Creek Rockshelter with Artefacts and PAD has high research potential as the excavation of the floor deposits within this site offers a rare opportunity to locate datable evidence that could indicate the period of time over which the Awabakal had been using the site and perhaps changes in how Aboriginal people used the site and surrounding landscape over time.

Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 5 and Palmers Creek Grinding Grooves 2 have been assessed as having moderate to high research potential based on the likelihood that adjacent areas of low gradient may have subsurface stone artefacts associated with the axe grinding process that could by their petrological/geochemical analysis add to the knowledge of Awabakal social interaction.

The remainder of the grinding groove sites are assessed as having low to moderate research potential as further analysis of the morphology of the grooves based on data derived from experimental work using the sandstone from the Sugarloaf Range area could provide more detailed information about what Aboriginal people were doing in the area and how much time they spent in the area grinding.

The lack of PAD (subsurface archaeological deposits that retain integrity) immediately at, or in the area of the artefact scatter and isolated find sites recorded in the proposed continued underground mining area limits their potential for research, though it does not limit their Aboriginal cultural heritage value. The degree of prior disturbance within the proposed continued underground mining area has resulted in an overall lack of site integrity, thus none of the known artefact scatter or isolated find sites can be seen to have greater than low to moderate research potential. It should be noted, however, that ridge crests, spur crests and midslope benches that have not been impacted by the construction of tracks (and thus afforded no site visibility) may have sites that are slightly less disturbed and which may have a greater level of research potential.

Brunkerville Trail AS1, GNW1 and Western Domain 8 contain a relatively high number of artefacts for surface scatters when compared to previously recorded sites in the area and thus have moderate research potential. Western Domain 5 is located in a unique environmental context. This site has unique attributes, which have the potential to contribute valuable information to the local archaeology of the area. Thus, this site is also seen as having a moderate degree of research potential.

The stone arrangements and scarred trees are assessed as having low to moderate research potential. While they are not assessed as being associated with PAD further research related to their location in the landscape and location relative to other sites of the same type within the Sugarloaf Range area could assist with gaining further knowledge of the Aboriginal use of what is not a well known area archeologically.

6.2.9 Archaeological Research Potential of the proposed continued Underground Mining Area

It is highly unusual for a project area, even very large project areas, to contain such a wide variety of site types (6) and such a large number of site types generally thought of as rare, including stone arrangements, grinding grooves, scarred trees, a rockshelter associated with

grinding grooves and a rockshelter with artefacts and PAD; plus a large number of sites containing stone artefacts (isolated find and artefact scatter sites). This is an extremely rare occurrence on a regional scale (lower Hunter Valley), though less rare on a local scale. That this is the opposite of what is usually found for project areas, clearly indicates that the proposed continued underground mining area and the broader Sugarloaf Range area (incorporating the SSCA) has the potential to provide substantial archaeological information in relation to Awabakal use of the landscape if it is researched in far more detail than allowed within the EA assessment process.

Thus the proposed continued underground mining area when viewed in its entirety is assessed as having moderate to high archaeological research potential. Some sites and areas such as those highlighted within **Sections 6.2.2 to 6.2.4 and 6.2.8** may have higher research potential than others, but as a whole the proposed continued underground mining area and the broader Sugarloaf Range/SSCA in general must be seen as an area worthy of further archaeological investigation.

7.0 Impact Assessment

The following summary of predicted and possible impacts to archaeological sites and landscape features of cultural heritage value within the proposed continued underground mining area and in its proximity are based on a recent subsidence prediction and impact assessment completed by Ditton Geotechnical Services (DGS) Pty Ltd (2009). A copy of the section of the DGS 2009 report relevant to Aboriginal heritage is included in **Appendix G**. **Figures 7.1** and **7.2** show the sites/landscape features colour-coded by their assessed level of impact.

All 62 sites assessed for their Aboriginal cultural and archaeological significance were assessed for potential to be impacted directly or indirectly by subsidence or directly by subsidence remediation works. Potential impacts to these sites will be discussed in **Section 7.1**. No impacts to Aboriginal sites/landscape features of Aboriginal cultural value are proposed due to surface infrastructure. The only new area currently identified for surface infrastructure is the area proposed for the Services Facility site (refer to **Figure 1.2**). No sites were located in this area which had been very heavily impacted by the construction of the F3 Freeway.

The locations of possible future ventilation infrastructure will not be known until after mining has commenced. Similarly, the location of any further exploration boreholes is currently unknown. It will be necessary for these areas to be assessed for their Aboriginal cultural and archaeological significance once they have been identified. They can then be managed in compliance with the ACHMP for the proposed continued underground mining area to be prepared in consultation with the registered Aboriginal stakeholders and the NPWS/DECCW.

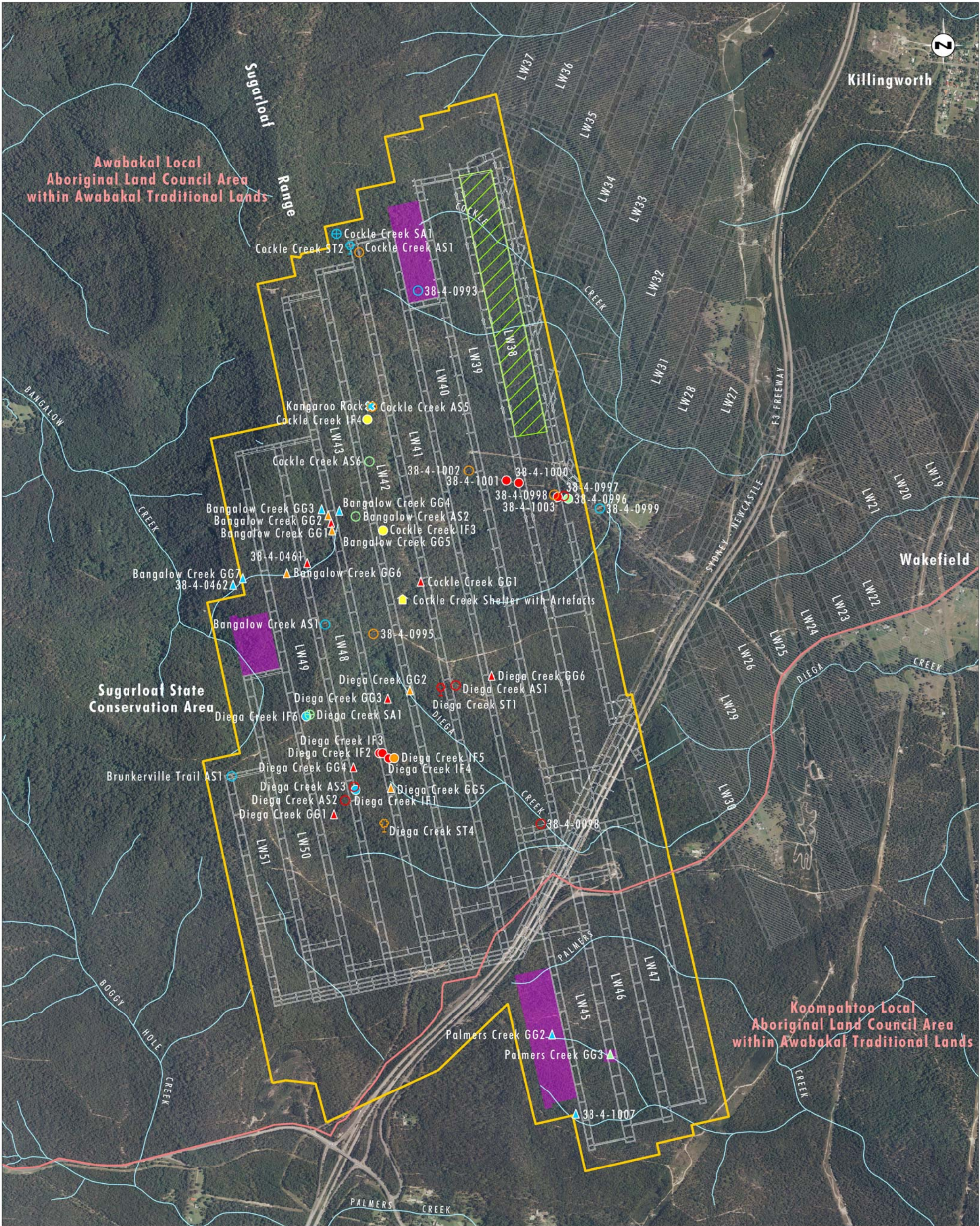
All of the landscape features assessed for their Aboriginal cultural value are within the proposed continued underground mining area. Potential impacts to these landscape features will be discussed in **Section 7.2**.

DGS assessed the potential for damage to the Aboriginal archaeological sites and landscape features based on predictions for 'final subsidence, tilt, strain and surface gradient change contours'. **Table 7.1** indicates the impact potential criteria used by DGS and provides a key for understanding **Table 7.2** and **7.3** provided in **Sections 7.1** and **7.2** respectively.

Table 7.1 – Impact Potential Criteria for Aboriginal Archaeological Sites and Aboriginal Landscape Features of Significance

Key	Cracking Potential	Indicative Probabilities of Occurrence	Predicted 'Smooth profile' Tensile Strain (mm/m)
VL	Very Low	Very Low (<5%)	<0.5
L	Low	Low (5 -15%)	0.5 - 1
M	Moderate	Medium (15 - 25%)	1 - 2
H	High	High (>25%)	>2
Key	Erosion Damage Potential	Indicative Probabilities of Occurrence	Predicted Surface Gradient Change
VL	Very Low	Very Low (<5%)	<0.3%
L	Low	Low (5-15%)	0.3-1%
M	Moderate	Medium (15 - 25%)	1-6%
H	High	High (>25%)	>6%

Excerpt from DGS 2009 – Table 21.



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

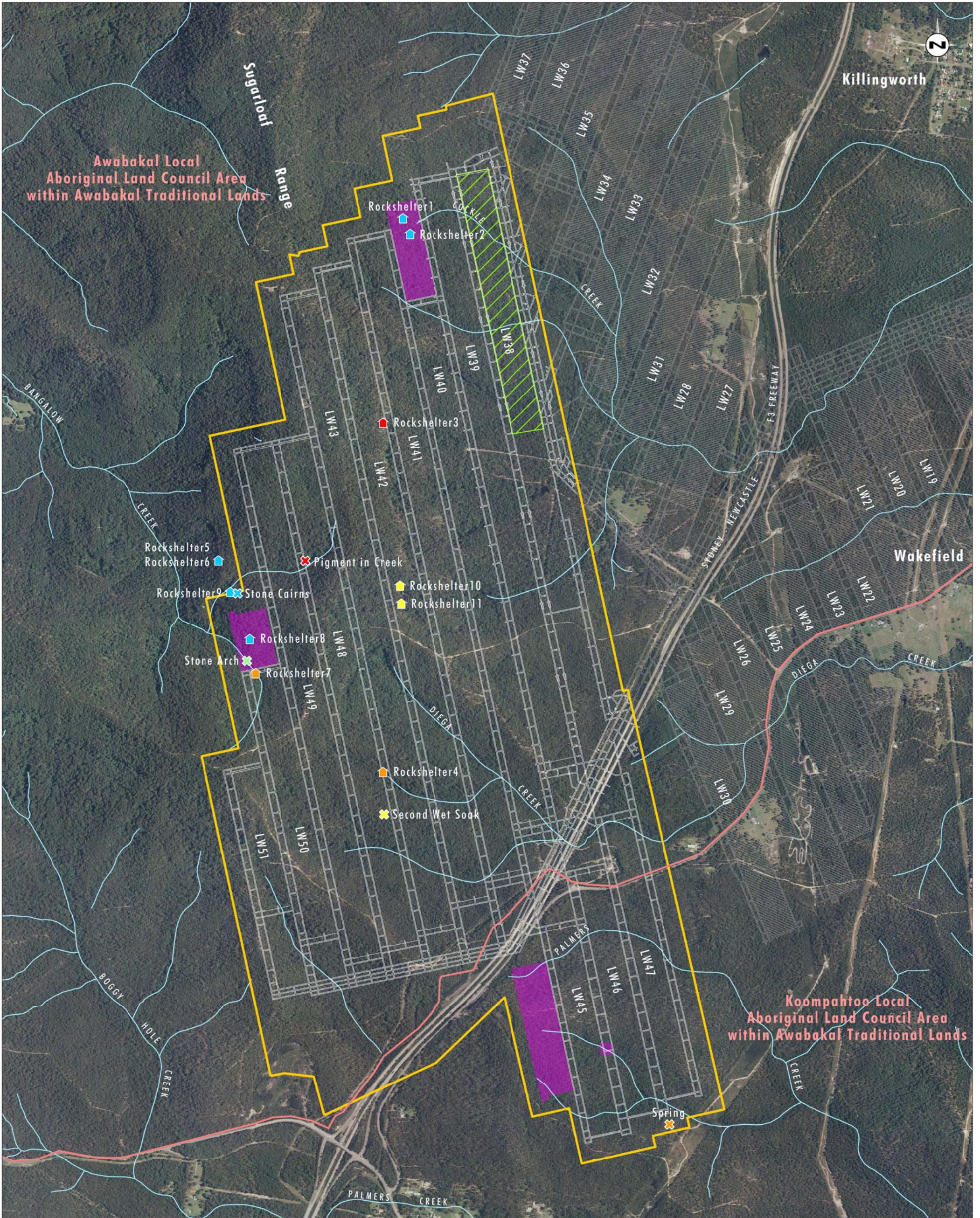
- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- Artefact Scatter
- Isolated Find
- ▲ Axe Grinding Groove
- Shelter with Deposit
- ⊕ Stone Arrangement
- ♀ Scarred Tree

- Level of Impact
- High
 - Moderate
 - Low-Moderate
 - Low
 - Very Low

FIGURE 7.1

Assessed Site Impacts



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- ✕ Feature of Aboriginal Cultural Value
- Rockshelter

- Level of Impact
- High
 - Moderate
 - Low-Moderate
 - Low
 - Very Low

FIGURE 7.2
Assessed Aboriginal
Cultural Feature Impact

The potential of the sites to crack due to subsidence was considered by DGS (2009) to be the most important or 'primary damage potential indicator' with erosion damage potential being a 'secondary indicator of damage'.

The following potential impacts have been taken into account in this impact assessment:

- cracking of sandstone benches, platforms within creekbeds which has the potential to damage grinding groove sites;
- cracking of sandstone benches, platforms, creekbeds which has the potential to cause waterflow to drain from the creekbed changing the environment of the grinding groove sites and the few sites with artefacts located near watercourses;
- the cracking of sandstone clifflines/outcrops which has the potential to cause cracking or total collapse of rockshelters;
- the cracking of sandstone bedrock which has the potential to change groundwater available to the living scarred trees which could result in their death;
- the potential for increased sediment loads in creeklines (due to erosive processes instigated by subsidence) to abrade and wear away grinding grooves and/or to bury grinding groove sites; and
- the potential for the cracking of soils within sites to damage sites directly or through the need to undertake subsidence remediation works.

7.1 Analysis of Potential Impacts to Sites/Predicted Loss of Aboriginal Cultural and Archaeological Value

Table 7.2 lists the sites located within the proposed continued underground mining area and the 'worst-case' level of impact predicted for each site by DGS (2009). The table also provides the assessed likely outcome of the predicted impact of subsidence and remediation works (mitigation options will be discussed in detail in **Section 8.0**). In order to assist with the assessment of the loss of Aboriginal cultural and archaeological values, **Table 7.2** also provides information in relation to the Aboriginal cultural significance of the site, the archaeological significance of the site and the site's assessed research potential. Within **Table 7.2** the sites shown in *italics* are outside the proposed continued underground mining area and the sites shown in **bold** are those that will not be impacted as the mine plans were changed in recognition of the Aboriginal cultural heritage and/or archaeological values of the sites.

It should be noted that following the DGS impact assessment, surveyors were engaged to rerecord the location of a number of the sites for which it was assessed the GPS reading may have been in error. This related to the nine Bangalow Creek Grinding Groove sites and the Cockle Creek Rockshelter with Artefact and PAD. All of these sites were located in areas where GPS reception was very poor. Subsequently the DGS contours for likely impact were used to assess likely impact to the sites.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Bangalow Creek Grinding Grooves 1	Very High to Extremely high	high	moderate to high	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
Bangalow Creek Grinding Grooves 2	Extremely High	moderate to high	moderate to high	M	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Bangalow Creek Grinding Grooves 3	Very High to extremely high	moderate to high	moderate to high	VL	Potential for cracking of the sandstone and the grooves it contains is assessed as very low. AND Loss of waterflow through site due to diversion through cracks upstream (but unlikely within the site) is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
Bangalow Creek Grinding Grooves 4	Extremely High	moderate to high	moderate to high	VL	Potential for cracking of the sandstone and the grooves it contains is assessed as very low. AND Loss of waterflow through site due to diversion through cracks upstream (but unlikely within the site) is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Bangalow Creek Grinding Grooves 5	Extremely High	high	low to moderate	M	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major road on ridge crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
Bangalow Creek Grinding Grooves 6	Extremely High	moderate to high	moderate to high	M	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. AND Loss of waterflow through site due to diversion through cracks upstream (but not in the site) is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. AND Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Bangalow Creek Grinding Grooves 7	Extremely High	moderate to high	low to moderate	VL On boundary continued underground mining area but outside direct subsidence impact area	Loss of waterflow through site due to diversion through cracks upstream is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. AND Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.
#38-4-0461	Extremely High	moderate	low to moderate	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Potential loss of waterflow through site due to diversion through cracks upstream/within the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. AND Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.
#38-4-0462 Grinding Grooves and Associated Rockshelter	<i>Extremely High</i>	<i>high</i>	<i>low to moderate</i>	VL <i>outside the proposed continued underground mining area</i>	<i>Loss of waterflow through site due to diversion through cracks upstream is possible.</i> <i>AND</i> <i>Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible.</i> <i>AND</i> <i>Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.</i>

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Cockle Creek Grinding Grooves 1	Very High to Extremely High	low to moderate	low to moderate	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/within the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. AND Potential burial of the site from increased sediment load in creekline is unlikely due to its position high in the catchment and lack of major tracks/exposed areas upstream likely to suffer from major soil loss.
<i>Cockle Creek Grinding Grooves 2</i>	<i>Very High to Extremely High</i>	<i>low to moderate</i>	low to moderate	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
Diega Creek Grinding Grooves 1	Extremely High	moderate	low to moderate	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek Grinding Grooves 2	Very High to Extremely High	low to moderate	low to moderate	M	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
Diega Creek Grinding Grooves 3	Very High to Extremely High	low to moderate	low to moderate	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek Grinding Grooves 4	Very High to Extremely High	low to moderate	low to moderate	Not assessed by DGS outcomes based on mapping H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
Diega Creek Grinding Grooves 5	Very High to Extremely High	low to moderate	low to moderate	Not assessed by DGS outcomes based on mapping M	Potential for cracking of the sandstone and the grooves it contains is assessed as moderate. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek Grinding Grooves 6	Very High to Extremely High	low to moderate	low to moderate	H	Potential for cracking of the sandstone and the grooves it contains is assessed as high. AND Loss of waterflow through site due to diversion through cracks upstream/in the site is possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is possible. Increased sediment most likely to be derived from cracking of major track on spur crest and subsequent remediation. AND Potential burial of the site from increased sediment load in creekline.
#38-4-1007 (Palmers Creek 1)	Extremely High	high	low to moderate	VL	No impact - outside of longwall layout. Area to the north also removed from mine plan.
Palmers Creek Grinding Groove 2	Extremely High	high	moderate to high	VL	No impact - outside of longwall layout. Area to the north also removed from mine plan.
Palmers Creek Grinding Groove 3	Extremely High	high	low to moderate	L	Impact from cracking assessed as low (5 to 15% possibility) as mine plan revised to enlarge chain pillar from 30 metres to 45 metres. Loss of waterflow through site due to diversion through cracks upstream is still possible. AND Abrasion and increased wear of the grooves resulting from increased sediment load within the creekline is unlikely as the tracks upstream will not be subsided and will not require remediation. AND Potential burial of the site from increased sediment load in creekline is unlikely.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Bangalow Creek AS1	Moderate	low	low to moderate	VL	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.
Bangalow Creek AS2	Moderate to High	low	low to moderate	L	Impact from cracking of soil profile following subsidence is assessed as low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.
Boggy Hole Creek AS1	<i>Moderate</i>	low	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
<i>Boggy Hole Creek IF1</i>	<i>Moderate</i>	<i>low</i>	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
Brunkerville Trail AS1	High to Very High	low to moderate	moderate	VL	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Cockle Creek AS1	Moderate to High	low	low to moderate	M	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Cockle Creek AS2	<i>Moderate to high</i>	<i>low</i>	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
Cockle Creek AS3	<i>Moderate to high</i>	<i>low</i>	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
Cockle Creek AS4	<i>Moderate</i>	<i>low</i>	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Cockle Creek AS5	Moderate to high	Low	low to moderate	M	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Cockle Creek AS6	Moderate to high	low	low to moderate	L	Impact from cracking of soil profile following subsidence is assessed as low and limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Cockle Creek IF1	Moderate	low	low to moderate	Not applicable outside the proposed continued underground mining area	No impact

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
<i>Cockle Creek IF2</i>	<i>Moderate</i>	<i>low</i>	<i>low to moderate</i>	<i>Not applicable outside the proposed continued underground mining area</i>	<i>No impact</i>
Cockle Creek IF3	Moderate to high	low	low to moderate	Not assessed by DGS outcomes based on mapping L-M	Impact from cracking of soil profile following subsidence is assessed as low to moderate and limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Cockle Creek IF4	Moderate to high	low	low to moderate	Not assessed by DGS outcomes based on mapping L-M	Impact from cracking of soil profile following subsidence is assessed as low to moderate and limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek AS1	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.
Diega Creek AS2	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the area in which the artefacts are exposed may damage surface and subsurface artefacts.
Diega Creek AS3	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the area in which the artefacts are exposed may damage surface and subsurface artefacts.
Diega Creek IF1	Moderate to high	low	low to moderate	VL	Impact from cracking of soil profile following subsidence is assessed as very low and limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek IF2	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.
Diega Creek IF3	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.
Diega Creek IF4	Moderate to high	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.
Diega Creek IF5	Moderate to high	low	low to moderate	M	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek IF6	Moderate to high	low	low to moderate	VL	Impact from cracking of soil profile following subsidence is assessed very low and limited to loss of artefact down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motorcycle track on which the artefact is exposed may damage surface and subsurface artefacts.
#38-4-0995 GNW1	High to very high	low to moderate	moderate	M	Impact from cracking of soil profile following subsidence is assessed as moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the track on which the artefacts are exposed may damage surface and subsurface artefacts.
Western Domain 1 (#38-4-0996)	Moderate	low	low to moderate	L	Site has been collected under existing DECCW AHIP #1098480. HOWEVER Cracking of soil profile following subsidence may reveal further artefacts on track. AND Remediation works to fix cracking may damage surface and subsurface artefacts.
Western Domain 2 (#38-4-0997)	Moderate	low	low to moderate	H	Site has been collected under existing DECCW AHIP #1098480. HOWEVER Cracking of soil profile following subsidence may reveal further artefacts on track. AND Remediation works to fix cracking may damage surface and subsurface artefacts.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Western Domain 3 (#38-4-0998)	Moderate to high	low	low to moderate	M	Site has been collected under existing DECCW AHIP #1098480. HOWEVER Cracking of soil profile following subsidence may reveal further artefacts on track. AND Remediation works to fix cracking may damage surface and subsurface artefacts.
<i>Western Domain 4 (#38-4-0999)</i>	<i>Moderate</i>	<i>low</i>	<i>low to moderate</i>	VL	<i>Outside continued underground mining area. Site has been collected under existing DECCW AHIP #1098480.</i>
Western Domain 5 (#38-4-0993)	Very high to extremely high	low to moderate	moderate	VL	Mine plan modified to avoid site.
Western Domain 6 (#38-4-1000)	Moderate	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts. AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Western Domain 7 (#38-4-1001)	Moderate	low	low to moderate	H	Impact from cracking of soil profile following subsidence is assessed as high but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts; AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Western Domain 8 (#38-4-1002)	Moderate to high	low	moderate	M	Impact from cracking of soil profile following subsidence is assessed moderate but limited to loss of artefacts down cracks and exposure of further artefacts by cracks. AND Remediation works to fix cracking/erosion of the motor bike track on which the artefacts are exposed may damage surface and subsurface artefacts; AND Requirements for clearing to allow access by machinery to fix cracks in an area where only motorbikes currently have access.
Western Domain 9 (#38-4-1003)	Moderate	low	low to moderate	H	Site has been collected under existing DECCW AHIP #1098480 Cracking of soil profile following subsidence may reveal further artefacts on track. Remediation works to fix cracking may damage surface and subsurface artefacts.
#38-4-0098 AS	Moderate	low	low to moderate	H	Cracking of soil profile following subsidence may impact site area and expose/bury artefacts. Remediation works to fix cracking may damage surface and subsurface artefacts.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
#38-4-0097 AS	Moderate	low	low to moderate	Not applicable outside the proposed continued underground mining area	No impact
Cockle Creek SA1	Extremely High	moderate to high	low to moderate	VL	Very low potential for cracking of soil profile following subsidence to impact stone arrangement and cause movement of stones. Remediation works to fix cracking may adversely impact stone arrangement.
Diega Creek SA1	Extremely High	moderate to high	low to moderate	L	Low potential for cracking of soil profile following subsidence to impact stone arrangement and cause movement of stones. Remediation works to fix cracking may adversely impact stone arrangement.
Cockle Creek Rockshelter with Artefacts and PAD	Very High to Extremely High	high	high	L-M	Subsidence may cause cracking of walls and roof of rockshelter. AND Potential for roof collapse. AND Cracking of floor deposits, loss of archaeological integrity of PAD.
Cockle Creek ST2	Very High	moderate	low to moderate	VL	Impact from cracking of soil/sandstone bedrock is assessed as very low. Greatest potential for impact is from subsidence remediation works.
Diega Creek ST1	Very High	moderate	low to moderate	H	Impact from cracking of soil/sandstone bedrock is assessed as high. Cracking of sandstone bedrock may cause groundwater loss and death of tree. Greatest potential for impact is from subsidence remediation works.

Table 7.2 - Potential Site Impacts/Possible Mitigation Options (cont)

Site Name	Aboriginal Cultural Significance	Archaeological Significance	Research Potential	DGS Impact Potential	Assessed Outcome of Potential Impact
Diega Creek ST4	Very High	moderate	low to moderate	Not assessed by DGS outcomes based on mapping M	Impact from cracking of soil/sandstone bedrock is assessed as moderate. Greatest potential for impact is from subsidence remediation works.

Table 7.2 indicates that:

- no impact is predicted for 10 sites ranging from moderate to extremely high Aboriginal cultural significance and of low and low to moderate archaeological significance and low to moderate research potential. These sites are in proximity to the boundary of the proposed continued underground mining area (but outside the boundary) and include one grinding groove site, six artefact scatters and three isolated finds;
- no direct impact is predicted for one grinding groove site (Bangalow Creek Grinding Grooves 7) of extremely high Aboriginal cultural significance and of moderate to high archaeological significance and low to moderate research potential, which is on the proposed continued underground mining area boundary but outside the subsidence impact area, however, indirect impact is still possible;
- no direct impact is predicted for one grinding groove site with an associated rockshelter (#38-4-0642) of extremely high Aboriginal cultural significance and of high archaeological significance and low to moderate research potential, which is outside the proposed continued underground mining area boundary and the subsidence impact area, however, indirect impact is still possible;
- no direct or indirect impact is predicted for two grinding groove sites of extremely high Aboriginal cultural significance and one artefact scatter of very high to extremely high Aboriginal cultural significance and of low to moderate and high archaeological significance and low to moderate and moderate to high research potential. Due to mine plan changes (Palmers Creek 1 #38-4-1007 and Palmers Creek Grinding Grooves 2) and the Western Domain 5 #38-4-0993 artefact scatter and wet soak will no longer be subject to any mine related impact;
- both direct and indirect impact is predicted as low for an additional grinding groove site (Palmers Creek 3) as the chain pillar width has been increased from 30 to 45 metres beneath the site; however, impact cannot be totally discounted. This site is of extremely high Aboriginal cultural significance and high archaeological significance and low to moderate research potential;
- potential damage due to cracking of the soil profile and subsequent remediation is predicted for 23 sites containing surface stone artefacts and the potential for subsurface stone artefacts (artefact scatters and isolated finds). These sites range from having moderate to high to very high Aboriginal cultural significance and low to low to moderate archaeological significance and low to moderate research potential;
- potential damage to subsurface artefacts (only) due to remediation works following cracking of the soil profile is predicted for four artefact scatter sites that have had their surface artefacts recently collected under s.87 AHIP #1098480 (the fifth site previously surface collected is outside the proposed continued underground mining area boundary). These sites are of moderate and moderate to high Aboriginal cultural significance and low archaeological significance and low to moderate research potential;
- potential minor damage due to cracking of the soil profile and subsequent remediation is predicted for two stone arrangements (Diega Creek Stone Arrangement 1 and Cockle Creek Stone Arrangement 1. These sites are of extremely high Aboriginal cultural significance and moderate to high archaeological significance and low to moderate research potential;
- potential damage of low to high impact due to cracking of the soil profile/sandstone bedrock and subsequent remediation is predicted for three scarred trees (Cockle Creek ST2, Diega Creek ST1 and ST4). These sites are of very high Aboriginal cultural

significance and moderate to high archaeological significance and low to moderate research potential;

- moderate to high likelihood of damage due to cracking of sandstone platforms, benches and creekbeds and enhanced erosion is predicted for 15 grinding groove sites of very high to extremely high to extremely high Aboriginal cultural significance and low to moderate (6), moderate (2), moderate to high (4), and high archaeological significance (3). The grinding groove sites were assessed as having moderate to high (3), to low to moderate (11) research potential; and
- low to moderate likelihood of damage due to cracking of the sandstone cliffline and potential failure of the roof of the Cockle Creek Rockshelter with Artefacts and PAD of very high to extremely high Aboriginal cultural significance and high archaeological significance and high research potential.

In summary, it is considered that the project has the potential to impact to varying extents on 49 (79%) of the 62 sites assessed. Of these sites 11 have extremely high Aboriginal cultural significance, nine have very high to extremely high Aboriginal cultural significance, two have high to very high Aboriginal cultural significance, three have very high Aboriginal cultural significance, 17 have moderate to high Aboriginal cultural significance and seven have moderate Aboriginal cultural significance. Seventeen of these sites also have moderate, moderate to high or high archaeological significance. Three sites (two grinding groove sites and one artefact scatter of extremely high and very high to extremely high Aboriginal cultural significance respectively and high and low to moderate archaeological significance will not be impacted due to mine plan changes. An additional grinding groove site (Palmer's Creek Grinding Groove 3) of extremely high Aboriginal cultural significance and high archaeological significance has a lower assessed potential for impact (reduced from >25% to between 5 and 15%) due to the revision of the mine plan to increase the width of the chain pillar proposed beneath the site.

7.2 Analysis of Potential Impacts to Landscape Features of Aboriginal Cultural Significance

Table 7.3 lists the landscape features identified within the proposed continued underground mining area and the level of impact predicted for that feature by DGS (2009). The table also provides information in relation to the Aboriginal cultural significance of the landscape feature. Within **Table 7.3** the landscape features shown in *italics* are outside the impact project area and the landscape features shown in **bold** will not be impacted as the mine plans were changed in recognition of the Aboriginal cultural heritage significance of the features.

Table 7.3 indicates that of the 17 landscape features assessed for impact:

- no impact is predicted for nine or 53% of all features. These features are of high to very high or extremely high Aboriginal cultural significance. Four of these (a spring and three rockshelters) are outside the proposed continued underground mining area), three rockshelters and the stone arch will not be impacted due to mine plan changes in recognition of their Aboriginal cultural significance, and one feature, a free standing boulder (Kangaroo Rock), will not be impacted by subsidence; and
- damage is predicted to the remaining eight or 47% of the landscape features (stone cairns/stacks, five rockshelters, the pigment source in the bank of Bangalow Creek and a second wet soak in the Diega Creek catchment of low to moderate to high to very high Aboriginal cultural significance.

Table 7.3 - Potential Landscape Feature Impact

Landscape Feature	Aboriginal Cultural Significance	DGS Impact Potential	Assessed Outcome of Potential Impact
<i>Spring</i>	High to very high	VL <i>Outside continued underground mining area</i>	<i>No impact is predicted for the spring.</i>
Wet Soak (2)	High to very high	Not assessed by DGS outcomes based on mapping H	Potential cracking of base of wet soak causing it to drain more quickly/dry out. AND Potential requirement for remediation of cracking. AND Potential infilling by sediment eroded from areas of cracking upslope.
Pigment in Bangalow Creek	High to very high	M	Cracking of the surrounding bedrock possibly resulting in fracturing and loss of pigment layers in creek bank.
Stone Arch	Extremely High	VL	Mine plan has been modified to avoid impact to this landscape feature.
Rockshelters 1, 2 and 8	High to very high	VL	Mine plan modifications have resulted in avoidance of impact to these landscape features.
Rockshelters 5, 6 and 9 (without archaeological evidence)	High to very high	VL <i>Outside continued underground mining area</i>	<i>No impact is predicted for the rockshelters.</i>
Rockshelter 3, (without archaeological evidence)	High to very high	Not assessed by DGS. Based on mapping H	Subsidence may cause cracking of walls and roof of rockshelter. AND Potential roof collapse. AND Cracking of floor deposits/PAD is not applicable.
Rockshelters 4 and 7 (without archaeological evidence)	High to very high	Not assessed by DGS. Based on mapping M	Subsidence may cause cracking of walls and roof of rockshelter. AND Possible roof collapse. AND Cracking of floor deposits/PAD is not applicable.

Table 7.3 - Potential Landscape Feature Impact

Landscape Feature	Aboriginal Cultural Significance	DGS Impact Potential	Assessed Outcome of Potential Impact
Rockshelters 10 and 11 (without archaeological evidence)	High to very high	Not assessed by DGS. Based on mapping L-M	Subsidence may cause cracking of walls and roof of rockshelter. AND Potential roof collapse. AND Cracking of floor deposits/PAD is not applicable.
Stone Cairns/Stacks	Low to moderate	VL	Low potential for cracking of soil profile following subsidence to impact stone cairns and cause movement of stones. Remediation works to fix cracking may adversely impact stone cairns.
Kangaroo Rock	High to very high	Not assessed by DGS VL	No impact is predicted as this is a free standing boulder that has rolled down from upslope – therefore it should not suffer any impact from subsidence.

7.3 Methods Available for Mitigation of Direct Impacts

Overall impact of varying extent is assessed as possible for 79% of the Aboriginal archaeological sites and 47% of the landscape features identified as having Aboriginal cultural value (or cumulatively 73% of all sites and features identified as of Aboriginal cultural value within the continued underground mining area).

A number of methods/strategies are available to mitigate direct impacts to the Aboriginal archaeological sites and landscape features of Aboriginal cultural significance within the proposed continued underground mining area. Available mitigation options must be assessed for their appropriateness from an Aboriginal cultural and archaeological perspective. Examples of management/mitigation options provided by mining companies in the past include:

- revision of the mine plan to avoid impact to sites/landscape features of high to very high and extremely high Aboriginal cultural value and/or of moderate, moderate to high and high archaeological significance and research potential;
- offsetting the potential for loss of Aboriginal archaeological sites and landscape values through an offset/offsets assessed as appropriate by the registered Aboriginal stakeholders, DoP, NPWS/DECCW and from an archaeological perspective;
- intervention to prevent damage (e.g. installation of props to prevent roof collapse of rockshelters; cutting slots around grinding grooves to isolate them from the bedrock, collection of artefacts prior to subsidence remediation works and their replacement when works completed);
- appropriate salvage of sites prior to impact (e.g. surface collection of artefacts, subsurface salvage of areas identified as having the potential for subsurface artefacts, excavation of the rockshelter with PAD, removal of scarred trees and their conservation elsewhere, removal of the sandstone platforms containing grinding grooves, removal of stone arrangements with careful recording of stone placement and the replacement of the stones following completion of subsidence);
- following subsidence sensitive repairs to grinding grooves if cracking occurs;
- repairs to stone arrangements if required following subsidence;
- repairing cracks to the ground surface associated with scarred trees; and
- using imported fill to repair soil cracking, rather than ripping/dozing.

Another option put forward by ADTOAC and ATOAC (17 March 2010) is:

- *Change mining operations to bord and pillar extraction under all Cultural Heritage sites within the proposed continued underground mining area to afford appropriate protection to those sites through mitigation practices and avoid any potential damage from subsidence.*

In response to this option WWC (5 May 2010) notes:

... that the potential for bord and pillar operations to be conducted in place of longwall extraction beneath key archaeological sites is deemed to be uneconomic at this point in time. For the mine plan to be modified to enable bord and pillar extraction beneath significant sites; longwall panels would be appreciably shortened and in some cases numerous relocations within a single block would be required. The impact of this upon the economics of the mine is significant, pushing the development to extraction tonne

ratio to the upper end of the scale whilst the high fixed cost associated with longwall operations would be maintained. A secondary impact of this would be a reduced annual output from the operation, driving the cost per tonne for production within a range which would make West Wallsend Colliery not economically viable. The combination of reduced profitability and lost reserves would prevent West Wallsend Colliery from being able to justify the capital investment required to convert the current efficient longwall operation into a bord and pillar mine.

In addition to being economically unviable. A bord and pillar operation would see a significant reduction in employment and loss of state revenue due to significant reduction in resource utilisation compared to a longwall mining operation.

To address the potential impacts to the sites significant modifications have been employed in the current mine plan to provide protection for several significant sites and further programs and strategies are proposed to offset potential impacts to the remaining sites.

Further to WWC's response ADTOAC (Shane Frost pers. com. 4 June 2010) and ATOAC (Dene Hawken and Kerrie Brauer pers. com. 1 June 2010) indicated that they felt the only appropriate management outcome would be no impact/total conservation of all the landscape features of Aboriginal cultural value and the Aboriginal archaeological sites within the proposed continued underground mining area (refer to **Section 8.1** for further details).

Typically a number of mitigation methods are compiled to form a management strategy for a project being assessed under Part 3A of the EP&A Act. The management strategy is implemented in compliance with an ACHMP prepared in consultation with the registered Aboriginal stakeholders, the NPWS/DECCW and a suitably qualified archaeologist. **Section 8.0** will discuss the management options available for the sites/landscape features proposed for impact by the project. The preferred management option for each site/landscape feature of Aboriginal cultural value which will be incorporated into the management strategy provided in **Section 9.0**. **Section 9.0** will also summarise the requirements of the proposed ACHMP and the Research Design and Methodology proposed for the salvage required if the project goes ahead (a more detailed outline of the ACHMP is provided in **Appendix H** and the Research Design and Methodology is detailed in **Appendix I**).

8.0 Management Options

The proposed mining within the continued underground mining area has the potential to impact 49 (79%) Aboriginal archaeological sites and eight (47%) landscape features identified as having Aboriginal cultural heritage value within the proposed continued underground mining area (ATOAC – 1 April 2010 – requests it be noted that this is cumulatively 73% of sites and landscape features recorded within the continued underground mining area). It is highlighted that both ADTOAC and ATOAC have voiced their distress at being put in the position of having to consider endorsing damage to any of the landscape features and Aboriginal archaeological sites within the proposed continued underground mining area and the legacy this leaves for their descendants and the lack of respect they felt this showed for the ancestral Awabakal people. **Section 8.1** further identifies the concerns of the registered Aboriginal stakeholders and provides a background to the approach used by the registered Aboriginal stakeholders when considering culturally appropriate management options for the proposed continued underground mining area.

From an archaeological perspective, Aboriginal archaeological sites are a finite and irreplaceable resource that has already been heavily impacted by mining and other development in the broader Hunter Valley. Thus DECCW requires proposals for site damage/destruction to be accompanied by appropriate mitigation (site salvage and/or management) and to be balanced by site and/or other conservation offset measures. Therefore, the management options discussed within this section of the report span conservation, conservation offsets and impact mitigation.

The necessity for this assessment to consider Intergenerational Equity was outlined as part of the DECCW's requirements for the Project (correspondence dated 11 November 2009). The management options, discussed in **Sections 8.2 to 8.5** therefore, have been prepared taking into account the need for the project outcomes to demonstrate Intergenerational Equity. **Section 8.6** explores the concept of Intergenerational Equity and determines if the preferred management options recommended for each Aboriginal archaeological site/landscape feature within the proposed continued underground mining area can be seen to conform to the concept of Intergenerational Equity.

Within **Sections 8.2 to 8.5** mitigation and management (including protection) measures are discussed and it is proposed by WWC that these will be implemented in compliance with an ACHMP for the proposed continued underground mining area. The ACHMP is to be prepared by WWC in consultation with the relevant registered Aboriginal stakeholders, NPWS/DECCW and an appropriately qualified archaeologist (if Project Approval is provided by DoP). If underground mining is to proceed the ACHMP will be designed to assist WWC manage and/or protect the Aboriginal archaeological sites and Aboriginal cultural landscape features within the proposed continued underground mining area over the life of the mine and ensure that when mining is completed that the sites/landscape features have been managed/protected in a culturally appropriate manner (refer to **Section 9.4** for further discussion in relation to the ACHMP and to **Appendix H** for a detailed outline of the ACHMP). The ACHMP will provide valuable information and specific management measures to be integrated into the NPWS POM for the broader SSQA.

8.1 Registered Aboriginal Stakeholder Approach to Determining Management Options

As noted in the Statements of Aboriginal Cultural Significance in the preface to this report and in **Section 3.0 Part A** and **Section 6.1**; the Sugarloaf Range area has been identified by all registered Aboriginal stakeholders as having extremely high Aboriginal cultural significance. It has been made very clear during the consultation process that considering any damage to this area causes much distress. ADTOAC and ATOAC (ADTOAC - Shane Frost pers. com. 4 June 2010 and ATOAC - Dene Hawken and Kerrie Brauer pers. com. 1 June 2010) have indicated that they feel 'as custodians of the area' it is not culturally appropriate to endorse any project that has the potential to impact on cultural heritage values.

The preferred management outcome from the perspective of all of the Aboriginal stakeholders (refer to **Appendix B, J** and **L**) is that there is no potential for impact to the landscape features of Aboriginal cultural heritage value and the Aboriginal archaeological sites within the proposed continued underground mining area. Conservation of all landscape features of Aboriginal cultural heritage value and Aboriginal archaeological sites, therefore, is the preferred management outcome.

The Aboriginal stakeholders having stated the preferred management outcome as being 'no impact/total conservation' (refer to **Appendix B, J** and **L**). However, the Aboriginal stakeholders recognised that there is a likelihood that WWC may still obtain Project Approval for the proposed continued underground mining area despite their objections. The Aboriginal stakeholders felt, therefore, that they had a responsibility to ensure that they have an active role in the implementation of management procedures for the landscape features of Aboriginal cultural value and Aboriginal archaeological sites if Project Approval is obtained by WWC. Therefore the management advice provided throughout **Sections 8.2 to 8.7** reflect the outcome that is acknowledged as the 'least objectionable', if total conservation is not a possibility

ADTOAC (1 June 2010) also provided the following statement in correspondence to WWC. The statement is in support of ADTOAC's request for no impact/total conservation of the landscape features of Aboriginal cultural value and Aboriginal archaeological sites within the proposed continued underground mining area (refer to **Appendix B** for a copy of this correspondence).

It is noted and appreciated that West Wallsend Coal (WWC) have made changes to their mine plan (see Mine Plan Modification 8.2.1) to accommodate the protection of archaeological sites important to the Awabakal People and Aboriginal Stakeholders registered in this project. It is also recognised as important and necessary that WWC has committed to a variety of Management and Mitigation options and Conservation Offsets to support the management and maintenance of Aboriginal archaeological sites and landscape features which are presented with the possibility/probability of damage within the continued underground mining area (see 8.2.2, 8.2.3, 8.2.4.). Also we acknowledge the Additional Offset Option (see 8.2.5) which was provided so that registered Aboriginal stakeholders could put forward ideas for consideration by WWC.

*As stated in our comments included in the **Draft Aboriginal Cultural Heritage and Archaeological Assessment, West Wallsend Colliery Continued Operations Project** 'we cannot support any damage by underground mining activities to the grinding groove sites, artefact scatters, scarred trees, stone arrangements, rock shelters or the landscape features'.*

For those who read this, we would draw your attention to the difficult position we have been placed in. It is very upsetting for our People to be put into a situation where we are supposed to make an informed determination from information gathered over a small period of time about things that have been in existence for many thousands of years. These decisions that will allow a coal company, whose main concern and end result in this whole sad saga is to make a profit from the resources that are contained beneath what is considered by our People, a landscape which is one of the richest areas within our region for Awabakal Cultural Heritage sites and a direct link to our Ancestors lives.

*We have been asked to provide an array of responses that will adequately address or alleviate the damage (or as it is written in the draft document possible impact) to as quoted from the draft, **'79% of the archaeological sites and 47% of the landscape features identified as having Aboriginal cultural value (or cumulatively 73% of all sites and features identified as of Aboriginal cultural value within the continued underground mining area)'**¹⁸. It is appalling to conclude that nearly three quarters of the Aboriginal archaeological sites contained within the continued underground mining operations of WWC within the Sugarloaf Range area would be considered to be of such significance that they are expendable in various degrees allowing the possibility of the destruction of many of our Cultural Heritage sites located within a landscape that has been a dominant feature within the history of our People the Awabakal for thousands of years.*

What legacy is this mine going to leave when it is finished ravaging the resources it is focused on in the pursuit of what many multinational corporations considers to be all important, being the monetary factor and not looking at the scars left behind on the environment and the original People of that area and their Cultural Heritage.

Is it alright to in a sense throw a few beads and baubles at People in return for what in fact is part of what helps make them what and who they are?? In reality this is what is expected of our People right now.

For us it is so important it could also be explained in this manner;

- a) *that if you had several close family members and you were put into a position where you had to chose one over the others, the one you choose is likely not to survive, there is a possibility they might, but a 100% assurance cannot be given of the risk they will be exposed to or the final outcome for them.*
- b) *Say you have 4 family members you have responsibility for protecting and preserving their lives, someone is going to put the lives of three of them in jeopardy, they give you the opportunity to save one of them out of the four, which one do you choose? Don't worry they are offering to give you something else in return for the three, some money and the help to rehabilitate those of your family that they have damaged and disabled in the process of them achieving their goals and also that there is a possibility that not all of these people will suffer the same fate or to the same degree. Added to this, they have offered that if you can find some other family members that are the same as those they want to take, then their actions are to be considered reasonable because you can replace the new ones you find for the old ones. People in the future will still be able to see family members; does it really matter that they aren't the original ones?*

¹⁸ Draft Aboriginal Cultural Heritage and Archaeological Assessment, West Wallsend Colliery Continued Operations Project, 7.3 Methods Available for Mitigation of Direct Impacts, page 7.26

Is this to be considered a reasonable offer in return for what was once 75% of your healthy, happy family? How do you make that decision? You can't; everyone is unique and their integrity and safety is what is paramount. You have been given a responsibility to care for them and that is what you must do. One is no less important than the other; in the end they all need protection.

'Therefore it distresses us to be coerced into making decisions that are culturally inappropriate. We cannot support any damage to OUR Cultural Heritage sites whether accidental or wilful through the proposed mining activities by WWC. We have a Cultural mandate handed down to us by our Ancestors to protect and preserve what they have left us, which is their legacy, and in turn becomes our legacy to those in the future'¹⁹

Overall we are the ones that loose out in the end, as usual. We stand to lose what is now the complete and unadulterated uniqueness of up to 73% of our Cultural Heritage sites. The mine, while causing this damage to our Cultural Heritage, will reap a reward for doing so through large profits, while our People are offered a resolution that represents a somewhat meagre and miserable outcome considering the probable results of this venture by WWC. Our People have always had to suffer the consequences of those who assume a power, somehow deemed upon them, which surpasses the rights and responsibilities of others so as to control the outcomes which they purport will apparently benefit everyone in the end. Is this just an excuse by some to justify a means to an end which brings a momentary and fleeting sense of financial hope for some and a profitable advantage for others but leaving those who have a connection beyond a pecuniary association with the dislocation and destruction of what has existed for thousands of years?

We can make all the excuses under the sun to give credibility to our argument, but what it comes down to in the end is, do people have the integrity to stand up for what is right and make decisions that reflect that integrity?

We would certainly hope so but again we have seen things in the recent history of this nation that could have been done better. Unfortunately, in the last couple of hundred years the resolve of some have played out these same situations again and again in our Traditional Awabakal Country contributing to a degradation, dislocation and irrevocable damage to ensue upon Awabakal People (ADTOAC - Shane Frost 1 June 2010).

ALALC provided the following statement (9 June 2010):

Awabakal LALC is opposed to the destruction of all Aboriginal cultural sites and landscape, which is within the project impact area for the OCAL West Wallsend Colliery. As already stated in our initial comments on the draft Archaeological Assessment for this project, we are strongly opposed to the proposed underground mining and other impacts associated with this project and also to the project area which will destroy our cultural landscape which has important environmental, social, health and cultural impacts to our community.

¹⁹ Draft Aboriginal Cultural Heritage and Archaeological Assessment, West Wallsend Colliery Continued Operations Project, Statement of Aboriginal Cultural Significance, ADTOAC, page E2.

It is noted that KLALC closed before having the opportunity to comment on the final draft of this report, however, as part of the draft report KLALC provided the following statement which is reiterated here as it reflects their support for conservation of the Aboriginal cultural values of the area.

The Sugarloaf Range, including the area proposed by WWC for their underground mine is very important to us, very significant and we want the sites and places up there looked after properly so that future generations can visit the sites and learn more about the Aboriginal past of this area. We want to be able to continue to go up there and see the sites and we want our grandchildren and great grandchildren and their great grandchildren to be able to do the same (Lois Towney of KLALC - comments from meeting 9 March 2010).

Please note that CCC (17 June 2010) requested its comments be removed from this section (refer to **Appendix J**).

8.2 Conservation Offset Strategy Options

Conservation outcomes are critical for all Aboriginal archaeological sites and landscape features of Aboriginal cultural heritage significance/value and of moderate, moderate to high or high archaeological significance and conservation and research potential. Conservation of such sites/landscape features acts to offset the overall loss of Aboriginal cultural heritage and archaeological values as the result of a proposed project. Conservation strategies are of importance in the lower Hunter Valley region, where ongoing development – forestry (logging associated with mining – pit props), agriculture and urban development, has already resulted in a significant loss of Aboriginal archaeological sites and values. In response, remaining Aboriginal archaeological sites and features of Aboriginal cultural significance are of increased cultural and archaeological value.

As stated in **Section 8.1**, conservation is the most desirable outcome for all Aboriginal archaeological sites and landscape features of Aboriginal cultural value from an Aboriginal cultural perspective. However, for all sites/landscape features of Aboriginal cultural value to be protected, this would mean that the majority of currently proposed mining developments would not be feasible/viable and that Intergenerational Equity would not be being practiced in relation to the contemporary community having rights to access to resources. Thus conservation as a management option is generally restricted to Aboriginal archaeological sites of high to extremely high Aboriginal cultural heritage significance/value and moderate, moderate to high and/or high archaeological significance and of moderate, moderate to high and/or high research potential. As Aboriginal archaeological sites with this level of significance are rare (and becoming rarer) due to impacts by development and time, it is becoming imperative (in terms of Intergenerational Equity) that a suite of these sites in the various landforms in which they occur are conserved for the future. Similarly, landscape features of highest Aboriginal cultural value should also be conserved.

It is noted that the SSCA includes a large number and diversity of Aboriginal archaeological sites including a relatively large number of grinding groove sites and that NPWS/DECCW is in the process of preparing a POM for the SSCA. Once implemented in 2013 this plan should offer the sites protection through active management. However, it is also noted that a large portion of the SSCA is within mining leases and that future proposals for impact to these sites by mining cannot be discounted, thus sites in mining leases within the SSCA are not currently assessed as being guaranteed of long-term conservation.

From an Aboriginal cultural heritage perspective conservation is assessed as the most desirable outcome by ADTOAC, ATOAC, ALALC and KLALC for all of the Aboriginal archaeological sites within the proposed continued underground mining area. From an

archaeological perspective conservation is assessed as the most desirable outcome for the following Aboriginal archaeological sites:

- Cockle Creek Rockshelter with Artefacts and PAD;
- Bangalow Creek Grinding Grooves 1;
- Bangalow Creek Grinding Grooves 2;
- Bangalow Creek Grinding Grooves 3;
- Bangalow Creek Grinding Grooves 4;
- Bangalow Creek Grinding Grooves 5;
- Bangalow Creek Grinding Grooves 6;
- Bangalow Creek Grinding Grooves 7 (indirect impact only#);
- #38-4-0461 Grinding Grooves;
- #38-6-0462 Grinding Grooves and Associated Rockshelter (indirect impact only#);
- Diega Creek Grinding Grooves 1;
- #38-4-1007 - Palmers Creek Grinding Grooves 1;
- Palmers Creek Grinding Grooves 2;
- Palmers Creek Grinding Grooves 3;
- Cockle Creek Stone Arrangement 1
- Diega Creek Stone Arrangement 1;
- Cockle Creek Scarred Tree 2;
- Diega Creek Scarred Tree 1;
- Diega Creek Scarred Tree 4; and
- #38-4-0993/Western Domain 5 Artefact Scatter and Wet Soak.

#Please note the Bangalow Creek 7 site (outside the proposed continued underground mining impact area) and the #38-6-0462 Grinding Grooves and Associated Rockshelter site (outside the proposed continued underground mining area boundary) may still be indirectly impacted by loss of waterflow through the site or impacted/buried by the addition of sediment to the creek bedload as a result of subsidence cracking upstream.

In relation to the landscape features of high Aboriginal cultural value that are predicted for impact by the project it is assessed by ADTOAC and ATOAC as appropriate from an Aboriginal cultural perspective to conserve all of the identified landscape features of cultural value. KLALC and ALALC supported the conservation of the following landscape features:

- the stone arch;
- the pigment site; and
- the five rockshelters (that did not have archaeological evidence of occupation/use).

The Aboriginal archaeological sites and landscape features of Aboriginal cultural value listed in the dot points above are concentrated in four areas: in the far north of the project area (and outside the area of subsidence impact), in the far south of the project area and in the west of the project area through to the central portion of the project area (refer to **Figures 6.1, 6.2 and 6.3**). Obviously if all Aboriginal archaeological sites and landscape features of Aboriginal cultural value, or if even only the sites/landscape features listed in the dot points above are to be conserved, longwall extraction will no longer be viable. In this regard, WWC has indicated that changing the mining operation to bord and pillar to avoid subsidence and potential damage to the sites and landscape features is not economically feasible (refer to **Section 7.3**).

8.2.1 Conservation - Mine Plan Modification

In recognition of the extremely high overall significance of the proposed continued underground mining area to the registered Aboriginal stakeholders, WWC has agreed to provide for the conservation of a number of Aboriginal archaeological sites and landscape features by modifying its mine plan in order to:

- avoid impact to the Palmers Creek 1 and 2 Grinding Groove sites of extremely high Aboriginal cultural significance and high archaeological significance and low to moderate and moderate to high research potential respectively;
- to avoid impact to the Western Domain 5 site (artefact scatter and wet soak) of very high to extremely high Aboriginal cultural value and low to moderate archaeological significance and low to moderate research potential, which has in turn protected Rockshelter 1 and 2;
- to avoid impacting a 'stone arch' a landscape feature of extremely high Aboriginal cultural value which has in turn protected Rockshelter 8; and
- to lessen the probability of impact to the Palmers Creek 3 Grinding Groove site (of extremely high Aboriginal cultural significance and high archaeological significance and low to moderate research potential) from >25% to 5 to 15% by increasing the width of the chain pillar beneath the site from 30 to 45 metres.

Thus two grinding groove sites, one artefact scatter associated with a wet soak and four landscape features (the stone arch and three rockshelters) originally within the proposed continued underground mining impact footprint will now not be impacted by subsidence; and one grinding groove site has a lower probability of being damaged by subsidence. Approximately 2.04 Mt of coal resource (valued on today's market at approximately \$150 million revenue) has been sterilised through the mine plan modification process to obtain this outcome. The grinding groove sites will be managed throughout the life of the mine in order to ensure that no indirect impacts from the mining process occur that may threaten their preservation (e.g. increased sediment in the creeklines due to works required to maintain roads upstream and/or subsidence cracking upstream).

It should be noted that these sites/landscape features are not to be conserved by WWC within formalised conservation zones; this is not possible as the sites/landscape features are already within the SSCA (owned and administered by NPWS/DECCW) and thus are in the care of the NPWS/DECCW. In this regard their preservation during mining will need to be

managed in consultation with the NPWS/DECCW and their conservation beyond the life of the mine lies in the hands of the NPWS/DECCW.

WWC has previously stated (refer to **Section 7.3**) that it will not be possible to modify its mine plan to conserve any of the remaining 49 (79%) Aboriginal archaeological sites and eight (47%) landscape features of Aboriginal cultural significance without it greatly reducing the viability of the Project. Thus management outcomes will be considered for some of the sites/landscape features listed above for which this is seen by WWC as an appropriate measure in regard to the type and level of impact predicted to ensure their survival beyond the life of the mine.

For other Aboriginal archaeological sites and landscape features of cultural value, alternative conservation offsets will be considered. In this regard, in view of the high significance of the Palmers Creek Grinding Groove 3 site and the 5 to 15% probability that it will still crack despite widening of the chain pillar; it is proposed that from an Aboriginal cultural and archaeological perspective a further offset should be considered to balance the potential loss of some of its Aboriginal cultural and archaeological values (refer to **Sections 8.2.2 and 8.2.3**).

8.2.1.1 Aboriginal Stakeholder Comments on the Proposed Management Option to Protect Sites by Mine Plan Modifications

Awabakal Descendants Traditional Owners Aboriginal Corporation

We applaud WWC management in their decision to protect the Palmers Creek 1 and 2 Grinding Groove sites, the Western Domain 5 (wet soak) site, the Stone Arch and Rockshelters 1, 2 and 8. We do have grave concerns still regarding Palmers Creek 3 Grinding Grooves and believe that there is still a possibility that this site will be severely impacted by the underground mine, even though there has been some measures put in place by WWC management to lessen the impact to this site. It would be our preference that this extremely culturally significant site is not impacted at all. This preference actually relates to all of the sites within the proposed continued underground mining area (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC considers that changing the mine plans to protect the Palmers Creek 1 and 2 grinding groove sites is a culturally appropriate outcome. Making the chain pillar under Palmers Creek 3 grinding grooves is commendable, however, it would have been even better if this site was not impacted. As the Palmers Creek sites are in KLALC's boundary we will support the comments provided by KLALC for these sites. The protection of rockshelters 1, 2 and 8 and the Western Domain 5 artefact scatter and wet soak site within ALALC's area is seen as

culturally appropriate. In relation to the Stone Arch ALALC has no comment (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC believes that changing the mine plans to avoid impacting the Palmers Creek 1 and 2 grinding groove sites, the Western Domain artefact scatter site with the wet soak, the stone arch and rockshelters 1, 2 and 8 is a culturally appropriate outcome and appreciate the WWC's actions in this regard. KLALC appreciate that WWC has increased the width of the chain pillar under the Palmers Creek 3 grinding groove site to lessen the likelihood that it may crack but it makes us very sad to think that this very beautiful site may still crack (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.2.2 Funding for Management of Cultural Heritage in SSCA

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts to any Aboriginal archaeological site/landscape feature of cultural significance within the proposed continued underground mining area; WWC has committed to providing \$200,000.00 (AU) over the life of the proposed continued underground mine project to assist with the management of Aboriginal cultural and archaeological sites/values within the SSCA.

WWC will set aside the \$200,000.00 (AU) prior to mining commencing and will allocate funding to cultural heritage management projects designed and prioritised in consultation with the relevant registered Aboriginal stakeholders and the NPWS/DECCW.

8.2.2.1 Aboriginal Stakeholder Comments on the Proposed Management Option of Funding for Management of Cultural Heritage in the SSCA

Awabakal Descendants Traditional Owners Aboriginal Corporation

We believe that the setting aside of funding for the management of Aboriginal culture heritage in the SSCA is to be commended. We, however, believe that much more than \$200,000.00 will be necessary to afford adequate protection and preservation measures for the expected mining operations and for ongoing protection, preservation and management of Aboriginal culture heritage beyond the life of the mine. Rather than increasing this amount however we believe that there are other offset options that are more culturally appropriate (refer to Section 8.2.5) (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC support the provision of funding for use for management of cultural heritage within the Sugarloaf State Conservation Area. ALALC has a team of 17 members who are trained to undertake land management projects. ALALC would like to see some of this money go towards the rehabilitation of old logging tracks within the Sugarloaf State Conservation Area to stop rubbish dumping along the tracks and vehicle damage to sites and the native vegetation (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC appreciates that WWC has committed to setting aside \$200,000 to be used over the next 10 years to fund projects for the management of Aboriginal sites and landscape features within the Sugarloaf State Conservation Area. But recognises that there are big problems in the area with 4WDs and bikes damaging sites and people dumping rubbish. KLALC would like to see this money going towards closing down roads to stop people driving over sites and dumping rubbish in and near sites. KLALC would like to see the closed tracks revegetated with native trees and with food and medicine plants (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.2.3 Ongoing Monitoring/Reporting of Subsidence Impacts

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts to any Aboriginal archaeological site/landscape feature of cultural value within the proposed continued underground mining area, WWC has committed to fund and manage a program of monitoring and reporting of subsidence impacts on Aboriginal archaeological sites and landscape features of Aboriginal cultural value recorded within the proposed continued underground mining area.

It is proposed that following the cessation of subsidence impacts to each longwall WWC ensure that an inspection of the subsided sites/landscape features of Aboriginal cultural heritage value is undertaken in order to collect a detailed database on exactly how each of the sites/landscape features is impacted. The inspection and reporting will be undertaken by the registered Aboriginal stakeholders and a suitably qualified archaeologist. The purpose of the monitoring is threefold, as described below.

In terms of Intergenerational Equity WWC will aim to identify which grinding groove sites are actually impacted by subsidence. As the predicted subsidence impacts range from <5% to >25% probability this also means that there is a >95% to <75% probability of not cracking. Thus it may be possible by monitoring the outcome of the subsidence that further information on the nature and extent of subsidence impacts may be determined. Recalibration of the subsidence impact model can then be undertaken which may allow a reassessment of the management options available. Information to be recorded includes:

- What percentage of the sites do/do not crack?
- What is the level and nature of the impact on a site specific basis?

- How does this relate to the location of the site relative to longwalls/chain pillars and their situation (e.g. on a sandstone bench, within a sandstone creek bed, pre-existing cracking and jointing)?
- Does this information allow refinement of the predicted impacts and thus management of subsidence on the unsubsided grinding groove sites within the proposed continued underground mining area?
- If so, does this information allow/require the revision of the management strategy for the remainder of the grinding groove sites for which subsidence is proposed?

There has been ongoing investigation and consultation in relation to the Diega Creek Grinding Grooves 1 site. Initially it was proposed if monitoring found that at least three of the Diega Creek Grinding Groove sites 2 through 6 did not suffer from impacts that caused cracking of the sandstone within the site area²⁰, then WWC would be able to go ahead with subsidence of Diega Creek Grinding Grooves 1. If this was not possible because 3 or more of the Diega Creek Grinding Grooves 2 to 6 sites had cracked, WWC would be required to revise the management strategy in consultation with the relevant registered Aboriginal stakeholders and to the satisfaction of the DECCW and DoP. Revisions to the management strategy may have included an alternative offset. Following ongoing consultation with the registered Aboriginal stakeholders on the working draft a subsequent offset was proposed by WWC in relation to the Diega Creek Grinding Groove 1 site which WWC considers will act to offset the potential for impact to the site from subsidence and allow for greater certainty for mining for WWC. This offset while acceptable from an archaeological site significance perspective was not endorsed by the registered Aboriginal stakeholders. Thus the management option initially discussed and agreed upon as 'least objectionable' by the Aboriginal stakeholders should longwall mining be approved (i.e. if monitoring found that at least three of the Diega Creek Grinding Groove sites 2 through 6 did not suffer from impacts that caused cracking of the sandstone within the site area, then WWC would be able to go ahead with subsidence of Diega Creek Grinding Grooves 1, alternatively WWC will need to review the management strategy at this time) will be the management option proposed for Diega Creek Grinding Grooves 1 (for details refer **Section 8.7** and **8.8**).

In relation to the Bangalow Creek Grinding Groove sites 1 through 6 and #38-3-0461 the reassessment of the probability of cracking to the sites may bring it back to a level acceptable from an Aboriginal and archaeological perspective (this may be necessary if similar sites or similar Aboriginal cultural and archaeological significance are not located outside MLs and within the SSCA – for details refer to **Section 8.2.4**).

The second aim of the monitoring is to provide a more detailed database of the outcomes of subsidence and the success of remediation works (where required) on all site types within the proposed continued underground mining area. This level of recording is rarely undertaken in relation to Aboriginal archaeological sites and landscape features of Aboriginal cultural value and will be extremely informative to WWC, registered Aboriginal stakeholders, archaeologists, NPWS/DECCW and DoP for undertaking and evaluating future assessments. A database of this nature would be an extremely valuable resource.

The third aim is to ensure compliance with the various aspects of the management strategy that relate to monitoring either before or after subsidence. In this regard it is proposed to record the:

- impacts of subsidence (if any);
- requirements for remediation (if any);

²⁰ The site area is defined as the area of sandstone that contains grooves.

- nature and extent of the remediation works;
- suitability of the remediation works;
- success of remediation works; and
- project approval compliance.

It is proposed that full pictorial records will be prepared for each site/landscape feature to inform the reporting process for the DECCW and DoP.

It is assessed from an archaeological perspective, if underground mining is approved, that the monitoring and recording of the impacts of subsidence and the success of remediation is imperative. Data of this kind will be very useful for recalibrating impact assessments and very informative when assessing future underground mining proposals.

8.2.3.1 Aboriginal Stakeholder Comment on the Proposed Management Option for Ongoing Monitoring

Awabakal Descendants Traditional Owners Aboriginal Corporation

The Awabakal Traditional Owners/Descendants are the determinants of their Culture and Heritage. As noted in Section 8.1 we do not endorse undermining of any of the Aboriginal archaeological sites and landscape features of cultural value. However if WWC obtain Project Approval the Awabakal Traditional Owners/Descendants agree with the ongoing monitoring/recording of subsidence impacts and see this as a necessity for the wellbeing of our Cultural Heritage. We would envisage that all necessary Training and equipment required to carry out this management option would be supplied by the WWC so as to satisfactorily perform and achieve these site management strategies to a high level and to collate the information collected. We believe that it is important for WWC to involve and utilise all Aboriginal Stakeholders to carry out the detailed site recordings through the said management option of monitoring and reporting (ADTOAC 17 March 2010 with revisions 4 June 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC support the provision of funding for ongoing monitoring of subsidence impacts on sites and the landscape after each long wall is removed. ALALC would require at least one ALALC representative to be present for the monitoring to assist with making decisions about repairs to sites and to check on the success of the repairs (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC can see the value in the monitoring of the sites and landscape features after each longwall is removed. We understand that the impacts of subsidence may go beyond the removal of a single longwall and that it may be necessary to monitor some sites a number of times before all impacts of subsidence can be seen. We want a KLALC representative involved in all monitoring in our LALC area and all decisions about fixing cracks and managing erosion when it is near sites in our LALC area. We also want to be present when any works are carried out in our LALC area that are near sites. We think the monitoring should also include going back to check if the works were successful. The information collected will help us make decisions in the future about the undermining of sites in our LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.2.4 Funding for Further Survey in the SSCA

The cluster of grinding groove sites in the upper catchment of Bangalow Creek (Bangalow Creek 1, 2, 3, 4, 5, 6, 7, #38-4-0461 and #38-4-0462) have such extremely high Aboriginal cultural value and moderate, moderate to high and or high archaeological significance it is proposed that they should be conserved and not subject to direct (Bangalow Creek 1, 2, 3, 4, 5, 6, and #38-4-0461) or indirect impact (Bangalow Creek Grinding Grooves 7 and #38-4-0462 Grinding Grooves and Associated Rockshelter) by underground mining. As discussed in **Section 6.2** clusters of grinding groove sites, grinding groove sites with associated rockshelters, grinding groove sites with associated PAD and grinding groove sites which demonstrate grinding of multiple implement types and multiple hours of grinding over multiple visits are rare locally (only one other similar cluster is known in the upper catchment of Surveyors Creek on the western fall of the Sugarloaf Range and this does not contain a rockshelter site and there are no similar clusters known on the eastern fall). Such clusters are even rarer regionally (no similar clusters of grinding groove sites are known outside the Sugarloaf Range). In addition there are no known clusters of similar grinding groove sites outside MLs that are guaranteed of long-term conservation. Thus the predicted direct/indirect impact of subsidence on these sites is not an outcome in accord with the concept of Intergenerational Equity.

It is recognised that modifying the mine plan to avoid direct and/or indirect impact to the nine Bangalow Creek Grinding Groove sites will have a major impact on the viability of the proposed continued underground mining project as it would mean the loss of sections of longwalls 43, 48 and 49. However, unless it can be demonstrated that there are similar sites with similar values within the Sugarloaf Range area that that can be conserved for the benefit of future generations, it will not be possible for this project to achieve Intergenerational Equity if damage/destruction of these sites is proposed without an offset strategy to balance this loss that is acceptable from an Aboriginal cultural heritage and archaeological perspective.

One of the major issues facing the Sugarloaf Range area is that although much of the area is within the SSCA (owned and administered by NPWS/DECCW), this is not recognised by the registered Aboriginal stakeholders involved in this assessment to date as having afforded the Aboriginal sites/landscape features of cultural significance within the SSCA any level of protection from impact by track construction and maintenance, 4WD vehicles, trail riders and rubbish dumpers. It is noted that there is currently a POM in preparation for this area that will be completed by approximately 2013 that may assist with addressing these issues, however, a number of the registered Aboriginal stakeholders involved in this assessment are currently

not involved in the preparation or implementation of this POM and thus do not feel assured that their concerns will be taken into account.

Taking into account the requirements of Intergenerational Equity and the need for the registered Aboriginal stakeholders involved in this assessment to have greater input into the management of sites in the SSCA; a conservation offset strategy is proposed by WWC that may enable undermining of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Groove sites and assist the NPWS/DECCW to manage the sites in the SSCA (including Bangalow Creek Grinding Grooves 7 and #38-4-0462 Grinding Grooves and Associated Rockshelter) while providing the registered Aboriginal stakeholders participating in this assessment with more input into the management process of sites within the SSCA.

The conservation offset strategy proposed aims to provide funding to assist the registered Aboriginal stakeholders involved in this assessment to locate, record and have an active role in preparing and implementing management recommendations for Aboriginal sites and landscape features of cultural significance within the SSCA. It is proposed by WWC that by funding further Aboriginal cultural survey and site/landscape/resource recording within the SSCA (and outside of MLs); and then by providing this information to NPWS/DECCW for inclusion in its POM for the SSCA (in consultation with ADTOAC, ALALC, ATOAC, CCC and NSWALC²¹) it may be possible to demonstrate that similar sites to Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves are located within the SSCA and outside MLs. If this proves to be the case, then the sites can be managed through the POM for the SSCA and this would provide a means by which WWC could demonstrate Intergenerational Equity and allow the mine to proceed with the removal of their longwalls in the Bangalow Creek catchment as proposed.

The following dot points outline the offset strategy proposed by WWC:

- during the approval process a meeting will be arranged by WWC with NPWS/DECCW, in consultation with ADTOAC, ALALC, ATOAC, CCC, NSWALC and an archaeologist to discuss:
 - WWC setting up a fund which they will administer for survey within the SSCA (outside the proposed continued underground mining area and outside ML areas);
 - the nature of the survey strategy; and
 - the requirements of the POM being prepared by the NPWS/DECCW for the SSCA so that the requisite information can be recorded during the survey;
- the survey that will include at least 20 days of survey and recording of sites and landscape values/resources within the SSCA by the relevant registered Aboriginal stakeholders and an archaeologist;
- additional funding will also be provided for the preparation and production of site cards (including the production of maps, plans, photographs); and
- following the completion of the survey and the compilation of the site cards additional funding will be provided by WWC to commission a suitably qualified person to assist WWC to prepare a statement, in consultation with the relevant registered Aboriginal stakeholders, for provision to DoP and NPWS/DECCW in relation to the suitability (in terms of their Aboriginal cultural and archaeological significance and conservation value) of the sites located outside MLs and within the SSCA as an offset (in terms of Intergenerational Equity) for the impact predicted from subsidence to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Groove sites.

²¹ NSWALC to provide comment on ongoing consultation in relation to the former KLALC area.

WWC will commit to revising the management strategy for the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites if it cannot be demonstrated that:

- there are suitable sites outside the proposed continued underground mining area and outside MLs in the SSCA that can be managed/conserved into the future to meet the requirements of Intergenerational Equity for all or some of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites (this will be site specific and depend on the outcomes of the survey and further consultation with NPWS/DECCW)

The revisions to the management strategy may include further survey or alternative offsets (including further consideration of the conservation of the sites) assessed as appropriate from an Aboriginal cultural and archaeological perspective.

While the strategy above proposes a start date for the survey within 24 months prior to site impact, WWC may commence work on the strategy at an earlier date if it would prefer to know the outcome of the survey sooner and to obtain more certainty for the project.

8.2.4.1 Aboriginal Stakeholder Comment on the Proposed Management Option of Funding for Further Survey

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC believe that additional survey is appropriate, however, we feel that at least 20 days should be provided for the survey to establish whether there are similar sites to the Bangalow Creek sites in SSCA and outside MLs. Consideration needs to be given to the safety aspect (OH&S) of site survey and appropriate timeframes afforded so as to decrease the likelihood of fatigue related accidents; which could result from minimal time being provided for such an challenging landscape. We would suggest that the 20 days survey should be undertaken over a period of two to three months to assist with fatigue related issues. Anyone who doesn't think it should take this long should come up and see how hard the going is.

We understand that if we do not locate sites of similar significance to the Bangalow Creek sites that WWC will be required to revise their management strategy. This would include the consideration of discontinuing their mining activities under the Bangalow Creek sites and if this is not realised then the issue of alternate offsets thought appropriate by ADTOAC need to be initiated and implemented (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC support the provision of funding for further survey within the Sugarloaf State Conservation Area and outside of mine leases. We would require at least one ALALC representative to be present during all days of survey within our LALC boundary. ALALC would also require to be involved in any decisions related to management of Aboriginal sites and landscape features of cultural significance within the area surveyed (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC understands that the additional survey is related to finding more sites like the Bangalow Creek Grinding Groove sites that are outside mine leases and in the Sugarloaf State Conservation Area. We also understand that this survey will mainly be undertaken within ALALC's boundaries. As this is not our area we support what ALALC want to do about further survey.

We also understand that the further survey is proposed to offset losses like the possible cracking of the Palmers Creek 3 Grinding Grooves. So we would like to see some of the 20 days dedicated to further survey within our LALC area. We can see that most of the area within the Sugarloaf State Conservation Area that is within the KLALC area is within mine leases. This is a very sad outcome for us. However, we would like the opportunity for another day or two to survey within our LALC boundary and within the area that has been set aside from mining to protect Palmers Creek 1 and 2 and within the area to the north and west of this that is still in our area but not to be mined (Lois Towney of KLALC - comments from meeting 9 March 2010).

Please note that due to the closure of KLALC the NSWALC will be providing comment on the results of the survey of the SSCA and will take part in the consideration of appropriate offsets and Intergenerational Equity that arise after the survey.

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.2.5 Additional Offset Options

In addition to the conservation offsets committed to in **Sections 8.2.1 to 8.2.4**, WWC offered to consider additional offset options put forward by the registered Aboriginal stakeholders.

ADTOAC, ATOAC, ALALC and KLALC had meetings with WWC over the period WWC during May and June 2010 to discuss their additional conservation offset options. Following consideration of the individual conservation offsets proposed WWC has committed to providing funding towards each of the projects. Details related to the additional conservation offset requests are provided in **Appendix L**. This Appendix will be restricted to viewing by the Aboriginal stakeholders, WWC, NPWS/DECCW and DoP and will not go on public exhibition.

8.3 Impact without Mitigation

This option is not thought appropriate for any of the Aboriginal archaeological sites/landscape features of Aboriginal cultural significance within the proposed continued underground mining area due to their importance to the registered Aboriginal stakeholders as discussed in **Sections 3.0 Part A, 5.2, 6.1 and 8.1**. From an archaeological perspective, site impact without mitigation is not assessed as appropriate due to the overall archaeological significance/research potential of the proposed continued underground mining area and the sites it contains.

8.3.1 Aboriginal Stakeholder Comment on the Proposed Management Option for Impact without Mitigation

Awabakal Descendants Traditional Owners Aboriginal Corporation

We believe that impact without mitigation is totally inappropriate, if undermining is approved all sites to be impacted must be mitigated up to a level that we as Traditional Owners consider as culturally appropriate for each individual site. This could possibly mean to return the sites to the condition they were in before being damaged by underground mining and above-ground activities associated with the underground mining process. Or it may mean not undertaking repairs if this is thought more culturally appropriate at the time (ADTOAC 25 March 2010 – revisions 4 June 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC do not think that impact to any site is appropriate without some form of mitigation endorsed by ALALC (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC supports that section above that states that impact to Aboriginal sites is not culturally appropriate without some form of mitigation (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4 Mitigated Impact

As discussed in **Section 7.3** a number of mitigation methods are available for use within the proposed continued underground mining area if underground mining proceeds. **Section 8.2** discussed a conservation offset strategy proposed by WWC which included revision of the mine plan to avoid impact to a number of sites/landscape features of extremely high Aboriginal cultural value and for offsetting the potential damage to other Aboriginal archaeological sites and landscape values across the remainder of the proposed continued underground mining area. The remaining mitigation options listed in **Section 7.3** are discussed in **Sections 8.4.1 to 8.4.2**. These mitigation options have been assessed by the registered Aboriginal stakeholders as the 'least objectionable' management outcome if longwall mining is approved despite their recommendations that no underground mining should proceed that has the potential to damage any of the Aboriginal archaeological sites and landscape features of Aboriginal cultural value with the proposed continued underground mining area (refer to **Section 8.1**).

8.4.1 Grinding Groove Sites

In light of the conservation offset provided by WWC in relation to the Palmers Creek Grinding Grooves 1 (#38-4-1007) and Palmers Creek Grinding Grooves 2 sites of extremely high Aboriginal cultural and high archaeological value due to mine plan modifications, it is assessed by WWC as feasible (in terms of Intergenerational Equity) to allow the subsidence of Cockle Creek Grinding Grooves 1, Diega Creek Grinding Grooves 2, Diega Creek Grinding Grooves 3, Diega Creek Grinding Grooves 4, Diega Creek Grinding Grooves 5 and Diega Creek Grinding Grooves 6 on the following conditions:

- that following subsidence an inspection is undertaken of the grinding groove sites by the relevant registered Aboriginal stakeholders and any cracking in the sandstone platforms, benches, creekbeds in association with the sites is repaired in a culturally sensitive manner and with the participation of representatives of the registered Aboriginal stakeholders and if deemed necessary by the registered Aboriginal stakeholders;
- that following subsidence the creeklines are monitored to ensure that no additional sediment load has been added to the waterflow that could act to abrade/wear away more quickly the grinding grooves;
- erosion control works are implemented upstream if required and feasible to control any additional sediment load in the creeklines caused by subsidence; and
- any cracking of the creekbed that is acting to divert water flow away from the sites is repaired in a culturally sensitive manner.

It is further proposed that information recorded in relation to impacts on the sites from undermining will be recorded and analysed and used to inform future mine planning and assessments. The recordings will form part of the monitoring process to be funded by WWC as described in **Section 8.2.3**.

As noted in **Section 8.2.4** subsidence of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461, Grinding Grooves sites and indirect impact on Bangalow Creek Grinding Grooves 7 and #38-4-0462, is not appropriate from an Aboriginal cultural and archaeological perspective unless the Offset Strategy discussed in **Section 8.2.4** is implemented and it is found that similar sites can be conserved within the SSCA. If this is realised the strategy proposed above by WWC is also recommended for these grinding groove sites where appropriate. Similarly, as noted in **Section 8.2.3**, if less than 50% of the Diega Creek Grinding Grooves 2 to 6 sites are impacted by cracking caused through subsidence, it will be appropriate to allow the

undermining of Diega Creek Grinding Grooves 1 and if this eventuates, the above mitigation strategy should also be used for this site.

If required, subsidence remediation works in close proximity to Aboriginal archaeological sites/landscape features will be undertaken in consultation with the registered Aboriginal stakeholders and NPWS/DECCW.

8.4.1.1 Aboriginal Stakeholder Comment on the Proposed Management Option for Grinding Groove Sites

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support any damage by underground mining activities to the grinding groove sites, however, if the WWC continued underground mine is approved we would endorse the mitigation methods outlined above. We would stress that we would require to be involved in all monitoring and to be present during all mitigation activities to ensure the protection of our cultural heritage.

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC does not want to see any of the grinding groove sites impacted by subsidence. However we recognise that this development will probably go ahead. Therefore if WWC gets Project Approval to subside these grinding groove sites then we will support the management proposed for the sites in our LALC area. Additionally, the ALALC would like to see the area monitored during the life of the mine as to providing information about the site back to the local Aboriginal community. This program is to be funded by the proponent. ALALC would prefer that a member of the LALC be on site when monitoring occurs (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC has three sets of grinding grooves in the mine area. Only one of these will be impacted as the mine has changed its plans. This is a good outcome. But the Palmers Creek 3 Grinding Groove site might still be impacted even though it is on a wider chain pillar. While we don't want this site impacted, if WWC does get approval to impact this extremely significant site we will want a KLALC representative there when the site is inspected and we will want that representative to come back to the LALC to discuss if there is cracking and whether or not it should be mended (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4.2 Artefact Scatters and Isolated Finds

It is proposed by WWC that endorsement of subsidence of the artefact scatter and isolated find sites within the proposed continued underground mining area (excluding #38-4-0993 Western Domain 5) is feasible due to the low levels of impact predicted on the following conditions:

- prior to remediation the site area is inspected and any artefacts exposed are collected;
- cracks are infilled using imported fill to avoid disturbing subsurface artefacts;
- following subsidence remediation works the artefacts are returned to the site area. For sites on tracks the artefacts will be placed off the track to avoid ongoing vehicular impact; and
- a revised site card is provided to the DECCW.

The surface collection, remediation works and artefact replacement will be undertaken in compliance with the protocols and procedures of the ACHMP to be prepared by WWC in consultation with the registered Aboriginal stakeholders, the NPWS/DECCW and an appropriately qualified archaeologist endorsed by WWC, the registered Aboriginal stakeholders and the DECCW. The ACHMP will provide detailed instructions in relation to each of the sites and the remediation works proposed (refer to **Section 9.4** and **Appendix H**). The surface collection will also be undertaken in compliance with the Research Design and Methodology provided in **Appendix I**.

It is further proposed that information recorded in relation to impacts on the sites from undermining will be recorded and analysed so that they may be used to inform future mine planning and assessments. The recordings will form part of the monitoring process to be funded by WWC as described in **Section 8.1.3**.

8.4.2.1 Aboriginal Stakeholder Comment on the Proposed Management Option for Artefact Scatters and Isolated Finds

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support damage by underground mining activities to any of the artefact scatters and isolated find sites, however, if the WWC continued underground mine is approved we would endorse the mitigation methods outlined above. We would stress that we would require to be involved in all monitoring and to be present during all mitigation activities to ensure the protection of our cultural heritage. We believe all the artefacts that are collected and recorded should be returned to their original location for culturally appropriate reasons; or as close as possible to that original location. We consider it culturally inappropriate for any reason to be given that these artefacts should not be returned in their entirety to their original locations. These artefacts, which are significant to the Awabakal Traditional Owners/Descendants, belong to the sites where they were originally discarded by our people. We would support scientific analysis of the artefacts but stress that 100% of the artefacts must be returned to the site area.

The Brunkerville Trail Artefact Scatter site has special significance because of a related landscape feature. It is not appropriate to discuss this feature in this report, however, the feature will not be impacted by subsidence and it will be monitored to ensure that any subsidence remediation in its proximity is undertaken in a culturally appropriate manner. ADTOAC will provide WWC and DECCW with details of this feature (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCS recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC would like to see all the artefacts collected so that they are no longer on the roads where they will be impacted by cars. We also don't think it is necessary for the artefacts to be analysed and would like them collected and then placed back in an area nearby where they are safe. ALALC would also like to retain a selection of the artefacts for our teaching collection and for display (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

There are no artefact scatters or isolated finds in the KLALC area. Therefore KLALC will support whatever management outcome ALALC wants within its LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4.3 Scarred Trees

It is proposed by WWC that endorsement of subsidence of the Cockle Creek 2, Diega Creek 1 and Diega Creek 4 Scarred Trees is feasible based on the limited potential for impact and on the condition that:

- the scarred trees are carefully recorded for future reference (as scarred trees have a finite life span ongoing preservation in the landscape is not feasible but a photographic record and scale drawing can assist with making information available for future generations); and
- any repairs to topsoil cracking within the area of the scarred trees be undertaken manually using imported fill and in a manner that avoids impact to the scarred trees (refer to **Section 9.1** and **Appendix H** for further details of protocols and procedures to be incorporated into the ACHMP in relation to scarred tree management).

It is not proposed that the trees be removed from the landscape as this is not thought appropriate from an Aboriginal cultural perspective and as it is possible that they will not suffer any adverse impact from subsidence or subsidence remediation works.

It is however, proposed that information recorded in relation to any impacts on the scarred trees and their environs from undermining will be recorded and analysed and used to inform future mine planning and assessments. The recordings will form part of the monitoring process to be funded by WWC as described in **Section 8.2.3**.

8.4.3.1 Aboriginal Stakeholder Comment on the Proposed Management Option for the Scarred Trees

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support damage by underground mining activities to any of the scarred tree sites, however, if the WWC continued underground mine is approved we would endorse the mitigation methods outlined above. We would stress that we would require to be involved in all monitoring and to be present during all mitigation activities to ensure the protection of our cultural heritage (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC supports the management of the scarred trees as outlined above (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

The scarred trees are highly significant sites and at least two of them are likely to be related to ceremony, but they are not in the KLALC area. Therefore KLALC will support whatever management outcome ALALC wants within its LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4.4 Stone Arrangements

It is proposed by WWC that endorsement of subsidence of the Cockle Creek 1 Stone Arrangement and the Diega Creek 1 Stone Arrangement is feasible based on the limited potential for impact and on the condition that:

- the stone arrangements are photographed from all angles and a scale drawing produced so that if any stones are moved/dislodged during subsidence that they can be replaced in the same manner to ensure the long term preservation of the stone arrangements; and
- any repairs to topsoil cracking within the area of the stone arrangements following subsidence will be undertaken manually using imported fill in a manner that avoids impact to the stone arrangements (refer to **Section 9.4** and **Appendix H** for further details of protocols and procedures to be incorporated into the ACHMP in relation to stone arrangements).

It is further proposed that information recorded in relation to any impacts on the stone arrangements and their environs from undermining will be recorded and analysed and used to inform future mine planning and assessments. The recordings will form part of the monitoring process to be funded by WWC as described in **Section 8.2.3**.

8.4.4.1 Aboriginal Stakeholder Comment on the Proposed Management Option for the Stone Arrangement Sites

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support damage by underground mining activities to either of the stone arrangement sites, however, if the WWC continued underground mine is approved we would endorse the mitigation methods outlined above. We endorse the scale drawing and numbering of the stones making mitigation methods more precise and allowing the stones to be restored to their original formation if displaced. We would stress that we would require to be involved in all monitoring and to be present during all mitigation activities to ensure the protection of our cultural heritage (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC supports the management of the stone arrangements as outlined above (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

The stone arrangements are important ceremonial sites that are extremely significant, but they are not situated in the KLALC area. Therefore KLALC will support whatever management outcome ALALC wants within its LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4.5 Cockle Creek Rockshelter with Artefacts and PAD

Part salvage ahead of undermining rather than total conservation of the Cockle Creek Rockshelter with Artefacts and PAD is assessed as feasible by WWC and appropriate from an archaeological perspective as the rockshelter roof is already significantly cracked due to natural causes and will inevitably fail whether the site is undermined or not. Thus salvage of part of the floor deposits prior to roof collapse will allow for the gathering of important information in relation to Aboriginal use of the rockshelter and possibly datable material that will assist with understanding the length of time over which the rockshelter and its environs were occupied by Aboriginal people.

The management strategy proposed below is recommended for the Cockle Creek Rockshelter with Artefacts and PAD.

- prior to undermining an area approximately 1.5 metres by 2.5 metres of the PAD (approximately 30% of the shelter floor deposits) will be manually excavated by suitably qualified archaeologists endorsed by the registered Aboriginal stakeholders and the DECCW, assisted by representatives of the registered Aboriginal stakeholder groups;
- prior to undermining and following the manual salvage the roof of the rockshelter will be propped to try to prevent roof collapse following subsidence (if feasible). If possible the section of the floor cleared by excavation will be used for the prop in order to avoid further damage to the deposit;
- the sieved material from the excavation will be placed in sand bags and returned to the rockshelter floor to assist with holding the remaining deposits in place and the roof prop in place. Some sediment will be retained to cover the bags so that the aesthetics of the rockshelter are returned as close as possible to prior to the excavation;
- following subsidence, if the roof does not collapse any cracking of the roof, walls or floor will be repaired in a culturally appropriate manner if necessary, safe and feasible (if stable the roof prop can be removed and the floor deposit stabilised);
- if the rockshelter does not collapse following subsidence, the artefacts will be returned for reburial within the excavated deposits (if safe); and
- if the rockshelter does collapse the artefacts will be put on display in a location agreed upon by the registered Aboriginal stakeholders and the DECCW.

As noted above, the rationale for removing 30% of the deposits is based on the potential that the roof may collapse as it already has major cracks, which if widened by subsidence will cause roof collapse. Roof collapse would prevent any future prospect of site investigation. However, if the roof does not collapse 70% of the floor deposit will still remain for the future (in recognition of Intergenerational Equity). It is noted here, that it is not expected that dense artefactual material will be located within the rockshelter. It is most likely that the level spur crest above the shelter was a camp site with the shelter used in inclement weather. The generally steeply sloping floor and steep drop outside the shelter mouth make it a dangerous place to sleep. However, the rockshelter deposits provide the only prospect of locating any artefactual material in a datable context, thus, excavation is warranted.

The manual excavation and the roof propping and crack repairs (to be undertaken where necessary, safe and feasible) will be implemented in compliance with the protocols and

procedures of the ACHMP to be prepared in consultation with the registered Aboriginal stakeholders, the NPWS/DECCW. The ACHMP will provide detailed instructions in relation to the manual excavation, roof propping and the crack remediation works proposed, where necessary, safe and feasible (refer to **Section 9.4** and **Appendix H**). The manual excavation will also be undertaken in compliance with the Research Design and Methodology provided in **Appendix I**.

It is also proposed that detailed recordings will be undertaken of the impacts of subsidence and any subsidence remediation works on the rockshelter so that this data will be available to inform future mine planning and archaeological assessments. The recordings will form part of the monitoring process to be funded by WWC as described in **Section 8.2.3**.

8.4.5.1 Aboriginal Stakeholder Comment on the Proposed Management Option for the Cockle Creek Rockshelter with Artefacts and PAD

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support any damage to the Cockle Creek Rockshelter by underground mining activities, however, if WWC obtain approval for their underground mine, ADTOAC will support the methodology proposed for the salvage of the Cockle Creek Rockshelter with Artefacts and PAD site. We would insist on having at least one representative each on site during any works/monitoring associated with this site. We would insist on 100% of all artefacts and any other material related to culture heritage after analysis be returned to the rockshelter – if this is not feasible then as close as possible. We would support scientific analysis of the artefacts but stress that 100% of the artefacts must be returned to the site area (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC supports the excavation of the rockshelter as outlined above (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

This rockshelter is an extremely significant site but it is not in the KLALC area. Therefore KLALC will support whatever management outcome ALALC wants within its LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.4.6 Landscape Features of Aboriginal Cultural Significance

As the landscape features are of cultural and not archaeological value, the subsidence of landscape features predicted for impact by the project can only be assessed by the Aboriginal stakeholders. As noted in **Section 8.1**, the registered Aboriginal stakeholders do not endorse this outcome. However, if WWC obtains Project Approval and taking into account the fact that nine landscape features of Aboriginal cultural value will not be impacted (e.g. stone arch, Rockshelters 1, 2, 5, 6, 8 and 9, Kangaroo Rock and the spring), the registered Aboriginal stakeholders have endorsed as 'least objectionable' the management outcomes for each of the landscape features as discussed below.

Rockshelters (without archaeological evidence of use/occupation)

If WWC obtain Project Approval, subsidence of the five rockshelters within the proposed continued underground mining area should be undertaken in compliance with the following conditions:

- following subsidence (where feasible and safe) cracking of the roof, walls or floor will be repaired in a culturally appropriate manner if thought appropriate by the relevant registered Aboriginal stakeholders; and
- information in relation to subsidence impacts and remediation is recorded as part of the monitoring and reporting process to be funded by WWC (refer to **Section 8.2.3**).

Wet Soak (2)

If WWC obtain Project Approval, subsidence of Wet Soak (2) should be undertaken in compliance with the following conditions:

- following subsidence any cracks in the base of the wet soak are infilled manually using imported fill;
- that following subsidence the wet soak is monitored to ensure that no additional sediment load has been added to the waterflow that could act to infill the depression;
- erosion control works are implemented upslope if required and feasible to control additional sediment load to the wet soak caused by subsidence; and
- information in relation to subsidence impacts and remediation is recorded as part of the monitoring and reporting process to be funded by WWC (refer to **Section 8.2.3**).

Pigment in Bangalow Creek

If WWC obtain Project Approval, subsidence of the pigment location in Bangalow Creek should be undertaken in compliance with the following conditions:

- following subsidence the registered Aboriginal stakeholders are afforded the opportunity to collect any loosened fragments of clay pigment; and
- information in relation to subsidence impacts and remediation is recorded as part of the monitoring and reporting process to be funded by WWC (refer to **Section 8.2.3**).

The clay pigment will be used by the Aboriginal stakeholders for teaching purposes.

Stone Cairns/Stacks

If WWC obtain Project Approval, subsidence of the stone cairns should be undertaken in compliance with the following conditions:

- prior to subsidence the stone cairns/stacks are photographed from all angles so that if any stones are moved/dislodged during subsidence that they can be replaced in the same manner to ensure the long term preservation of the stone cairns;
- any repairs to topsoil cracking within the area of the stone cairns/stacks following subsidence be undertaken manually using imported fill in a manner that avoids impact to the stone cairns/stacks; and
- information in relation to subsidence impacts and remediation are recorded as part of the monitoring and reporting process to be funded by WWC (refer to **Section 8.2.3**).

Refer to **Section 9.2** and **Appendix H** for further details of protocols and procedures to be incorporated into the ACHMP in relation to landscape features of Aboriginal cultural significance.

8.4.6.1 Aboriginal Stakeholder Comment on the Proposed Management Option for the Landscape Features

Awabakal Descendants Traditional Owners Aboriginal Corporation

ADTOAC would hate to see and cannot support any damage by underground mining activities to the landscape features, however, if the WWC continued underground mine is approved we would endorse the mitigation methods outlined above. We would stress that we would require to be involved in all monitoring and to be present during all mitigation activities to ensure the protection of our cultural heritage (ADTOAC 25 March 2010).

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC will make no comment of landscape features relating to stone stacks (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

Only the spring is within the KLALC boundary and this important landscape feature will not be impacted which is a good outcome. Protecting the stone arch and three of the rockshelters which are extremely significant is also seen as good. KLALC, however, cannot comment on the management of the other landscape features that will be impacted as they are not in our area. Therefore

KLALC will support whatever management outcome ALALC wants within its LALC area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.5 Future Ventilation Infrastructure and Exploration Boreholes

In **Section 7.0** it was noted that it may be necessary for ventilation infrastructure to be constructed within the proposed continued underground mining area once mining has commenced (if mining is approved). It is also probable that there will be a need for further exploration boreholes, drilling of some of which may occur prior to approval. It is proposed that once the areas proposed for impact have been identified that they will be inspected by the registered Aboriginal stakeholders and an archaeologist and that they will be situated whenever possible outside culturally sensitive areas/sites. If this is not possible a management outcome will be undertaken in compliance with protocols and procedures set out in the ACHMP to be prepared in consultation with the DECCW and the registered Aboriginal stakeholders.

8.5.1 Aboriginal Stakeholder Comment on the Proposed Management Option for Future Ventilation Infrastructure and Exploration Boreholes

Awabakal Descendants Traditional Owners Aboriginal Corporation

At the present moment there is not enough information to make informative decisions regarding the placement of proposed ventilation facilities and exploration boreholes. The only way in which we can be comfortable that culturally appropriate management decisions are being made is if we have a procedure in the ACHMP that allows us to inspect the location and to have input into the management of that location in a culturally appropriate manner. Therefore we support the above management option in the absence of anything more detailed. We understand that we will have full input into the preparation of this procedure when the ACHMP is being written. We would be recommending that if a site is to be impacted that there be:

- *salvage of any cultural heritage material;*
- *possible subsurface investigations to ascertain the full extent of the cultural heritage values; and/or*
- *some form of culturally appropriate offset.*

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCW's recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC supports the management of the ventilation infrastructure and the exploration boreholes using protocols and procedures that are provided within an Aboriginal Cultural heritage Management Plan. But only if ALALC are involved in the preparation of the Plan and if ALALC has a representative on site when the areas proposed for impact are inspected and has a role in any decision made at that time about impact (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC understand that there is some infrastructure that may impact small areas that the mine does not yet know where it will need to go. We understand that the Aboriginal Cultural Heritage Management Plan will say that WWC will need to get a representative of KLALC out to inspect any area that is within our LALC area that they want to impact with boreholes and gas drainage bores. We understand that wherever possible sites will be avoided but if they can't be avoided WWC will manage the site in consultation with KLALC and DECCW. We support this management procedure (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.6 Do the Management Options Proposed Address Intergenerational Equity?

As noted in **Section 8.1** the DECCW's requirements (correspondence dated 11 November 2009) identified the need for this assessment report to consider Intergenerational Equity.

If impacts on Aboriginal cultural values are proposed as part of the final development, an assessment of the regional significance of the values to be impacted, the extent to which these values are protected elsewhere in the landscape and consideration of the proposed impacts in the contexts of 'inter generational equity; should be undertaken (DECCW 11 November 2009).

The local and regional significance of the Aboriginal archaeological sites and the Aboriginal cultural value of the landscape features within the proposed continued underground mining area were discussed in detail in **Section 6.0** and were incorporated into the impact assessment provided in **Section 7.0**; before being used to assist with the provision of what are proposed as culturally and archaeologically appropriate options (if mining longwall mining is approved) for the management of the Aboriginal archaeological sites/landscape features in **Sections 8.2 to 8.5**. The 'extent to which these values are protected elsewhere' was investigated throughout **Section 6.0** (in relation to rarity and representativeness). Based on an analysis of the significance and impact assessment, a number of management options were proposed including:

- modifying the mine plans to protect two sets of grinding grooves, an artefact scatter site associated with a wet soak, the stone arch and three rockshelters (not Aboriginal archaeological sites);

- the provision of \$200,000.00 (AU) funding by WWC prior to mining commencing. This funding will be allocated to cultural heritage management projects in the SSCA designed and prioritised in consultation with the relevant registered Aboriginal stakeholders and the NPWS/DECCW;
- the provision of funding by WWC to undertake detailed monitoring of the impacts of subsidence and subsidence remediation works on the Aboriginal archaeological sites and landscape values on a longwall extraction basis over the life of the proposed continued underground mining area to provide a detailed database to inform future underground mining assessments and the possibility of undermining the Diega Creek Grinding Grooves 1 site;
- the provision of funding for further survey of the SSCA by the relevant registered Aboriginal stakeholders and an archaeologist in an attempt to locate sites of similar nature and significance to the none Bangalow Creek grinding grooves sites that can managed for their long term conservation and for the participation of the relevant registered Aboriginal stakeholders in the preparation and provision of information related to site location/management to NPWS/DECCW for inclusion in the POM the SSCA;
- the provision of funding to the registered Aboriginal stakeholders to allow them to individually finance projects related to the conservation of Aboriginal cultural heritage (refer to **Section 8.2.5** and **Appendix I**); and
- implementation of a program of mitigation of impacts to Aboriginal archaeological sites/landscape features of Aboriginal cultural value on a longwall extraction basis as committed to by WWC in this assessment (for details refer to **Section 9.1**).

It is proposed by WWC that in concert the management options listed above have the potential to address the requirements of Intergenerational Equity. It is noted if the outcomes of the survey proposed within the SSCA (and outside MLs) indicates that the requirements of Intergenerational Equity cannot be met, or if the monitoring program identifies that more than 50% of the Diega Creek Grinding Groove sites have cracked prior to undermining Diega Creek Grinding Grooves 1, then the management strategy will be reviewed in consultation with the relevant registered Aboriginal stakeholders and the DECCW and a culturally appropriate revised management strategy identified for these sites/areas. The requirement for revisions to the management strategy and the extent of any revisions can only be known when the proposed survey/relevant part of the monitoring program is completed (please note that subsequent to this assessment of Intergenerational Equity, WWC committed to an additional offset in relation to Diega Creek Grinding Grooves 1. This offset was assessed as not appropriate by the registered Aboriginal stakeholders – for details refer to **Sections 8.7** and **8.8**).

8.6.1 Definitions

Ecologically sustainable development is defined as:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (DECC 2008)

Intergenerational equity is defined as:

The present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (DECC 2008)

In both cases, the focus is on the long term time scale – generations and longer into the future. The management challenge from WWC's perspective is to achieve short term objectives (i.e. meet the needs of current generations, meet current production targets, meet current State policy and planning targets), but maintain confidence that similar opportunities, resources and environmental conditions will be available for future generations to manage.

Intergenerational Equity incorporates physical (natural), social and economic aspects of the environment, as filtered through cultural perspectives. In a cultural context and for this project, Intergenerational Equity therefore requires that Awabakal cultural assets (be they sites, artefacts, landscape features of cultural value, or capacity to maintain cultural identity and attachment to place) will still be present and will maintain integrity in the future.

While landscapes and Aboriginal communities wants and needs change over time, a continuing theme is that Aboriginal communities seek to maintain a sense of identity and attachment to places within the landscape that are known/important to them. Cultural concepts of Intergenerational Equity incorporate (but are not restricted to):

- cultural values: past, contemporary and future;
- sense of cultural identity (in this case what it means to be an Awabakal person or an Aboriginal person who lives within Awabakal lands);
- attachment to the Awabakal traditional landscape;
- the connection of culture and country – the dependence of cultural continuity on a 'healthy' natural landscape where biodiversity, watercourse health, land surface integrity etc are maintained or improved;
- capacity to use cultural identity as a valid reason to influence approaches to land use, planning and management;
- protection of a diverse and accessible suite of physical evidence of cultural connectedness to the landscape, through sites, artefacts and landscape features of cultural value;
- ongoing awareness and passing on, within the community, of traditional knowledge (stories, resources, methods, custodial rights, obligations and ceremonies); and
- Aboriginal community well being, as indicated by feelings of involvement/engagement, respect, trust and cooperation.

8.6.2 Does the management approach proposed for the project give effect to these cultural concepts of Intergenerational Equity?

Cultural values: past, contemporary and future

The assessment process has provided all Aboriginal stakeholder participants with the opportunity to provide information in relation to the contemporary and past cultural value of the proposed continued underground mining area and to identify those resources and landscape values that are/have been important to them through the survey and assessment process and from their oral history. Past and contemporary cultural values have been incorporated into the significance and impact assessments and have been used to justify/support the various management options presented in **Sections 8.1 to 8.5**. Cultural values of the future have been addressed (as far as possible) through a variety of management outcomes aimed towards ensuring the conservation of a representative sample of sites/landscape values into the future.

Cultural practice has been viewed in relation to the provision of access to the proposed underground mining area for the Awabakal participants (and the broader Aboriginal community) in order to continue the use and to participate in the management of an area of cultural importance. In this regard the proposed ACHMP for the proposed continued underground mining area will support ongoing Aboriginal practice and the provision of information to inform the POM for the SSCA, which it is proposed will have a similar theme.

Sense of cultural identity (in this case what it means to be an Awabakal person or an Aboriginal person who lives within Awabakal lands)

Participating registered Aboriginal stakeholders have been encouraged to provide information in relation to their sense of cultural identity and custodial rights how these may be impacted by possible damage to Aboriginal archaeological sites/landscape features of cultural heritage value. Information provided has been used to assess site/landscape feature significance and to provide Awabakal people a voice in determining preferred and 'least objectionable' management outcomes that will allow Awabakal descendants to maintain a sense of cultural identity/custodial rights when they visit the proposed continued underground mining area and the broader SSCA.

Attachment to the Awabakal traditional landscape

The participating registered Aboriginal stakeholders and past Awabakal spokespeople provided a very heartfelt assessment of their attachment to the landscape of the Sugarloaf Range area in **Sections 3.1, 5.2, 6.1 and 8.1** of this assessment report. This attachment to the landscape was recognised at an early stage of the assessment process and mine plans modified in recognition of the significance of protecting a number of sites and landscape features identified as having particular Aboriginal cultural value. The Aboriginal cultural significance of the area was also taken into account when preparing the management strategy which aims to ensure that a representative sample of sites is conserved for the contemporary and future Awabakal peoples, whilst still allowing for mining feasibility.

The connection of culture and country – the dependence of cultural continuity on a 'healthy' natural landscape where biodiversity, watercourse health, land surface integrity etc are maintained or improved

During the survey period the participating registered Aboriginal stakeholders spoke of the importance of keeping their country healthy. A great deal was said of the impacts to sites, places and resources that have occurred due to the construction of tracks into the Sugarloaf Range which have allowed access to 4WDs, motor bikes and rubbish dumpers. It is proposed that the ACHMP for the proposed continued underground mining area and the data to be provided to inform the POM for the SSCA will enable better management of this area for contemporary and future generations of Awabakal people and that this will improve the health of the landscape.

Capacity to use cultural identity as a valid reason to influence approaches to land use, planning and management

WWC has recognised 'cultural identity' by encouraging the registered Aboriginal stakeholders to bring their voice to this assessment report. WWC has recognised the validity of the use of 'cultural identity' to influence approaches to land use in its approach to mine planning and has acted to sterilise an estimated \$150 million of coal resource based largely on the Aboriginal cultural value of sites and landscape features to the Awabakal.

It is proposed that further influence in relation to land use will arise by participation of the registered Aboriginal stakeholders in the preparation and implementation of the ACHMP for

the proposed continued underground mining area and by providing the registered Aboriginal stakeholders with a means to provide advice in relation to the location and management of sites within the SSCA. In this manner the Aboriginal stakeholder representatives will have the opportunity to influence WWC and the NPWS/DECCW's approach to land use planning and management, so that it is more culturally appropriate from an Awabakal perspective.

Protection of a diverse and accessible suite of physical evidence of cultural connectedness to the landscape, through sites, artefacts and landscape features of cultural value

It is proposed that the management outcomes presented within this report (prepared in consultation with the registered Aboriginal stakeholders) will act to protect a 'suite of physical evidence of cultural connectedness to the landscape' through appropriate management of sites, through the conservation outcomes provided by changes to the mine plans and by the management strategy proposed that will allow for the location, recording and management of a suite of currently unknown sites.

Ongoing awareness and passing on, within the community, of traditional knowledge (stories, resources, methods, rights, obligations and ceremonies)

It is proposed that this will be enabled through a greater understanding of the cultural resource of the SSCA that will arise as part of the management strategy and through the involvement of the registered Aboriginal stakeholders in the management of that resource.

Aboriginal community well being, as indicated by feelings of involvement/engagement, respect, trust and cooperation

It is proposed that this will be achieved through the involvement of the registered Aboriginal stakeholders in the management of Aboriginal cultural heritage within the proposed continued underground mining area and broader SSCA and that as an outcome of the working relationship that will develop between WWC and the registered Aboriginal stakeholders and the NPWS/DECCW, that mutual respect, trust and cooperation can grow.

8.6.3 Aboriginal Stakeholder Comment on Intergenerational Equity

Awabakal Descendants Traditional Owners Aboriginal Corporation

Without the implementation of the offset proposed by ADTOAC in Appendix I and other offsets proposed by WWC in Section 8.2 we do not believe the management options meet the Intergenerational Equity requirements to sufficiently afford an equitable outcome for what we believe is a culturally significant landscape and what spiritually and tangibly connects us to what is a rich and vibrant part of our cultural heritage and our ancestors.

In additional comment provided on 6 June 2010 (refer to **Appendix I**) ADTOAC stated:

*We see **Intergenerational Equity** as a provision for future generations to benefit from what has transpired in the past and to have been left as much as the previous generation. If **73%** of **ALL** sites and features identified as of Aboriginal Cultural value within the continued underground mining area are put at risk of being destroyed/damaged by WWC, then there is little likelihood of leaving as much for future generations as what the current generation has, even if more sites are located that are similar outside of the continued underground mining operations of WWC. So to then meet **Intergenerational Equity** WWC would need to demonstrate that at least an economic and social platform has been established and is available and left in perpetuity for the next generation of*

Awabakal People and their descendants. *This does not mean just for the life of the WWC mine, or this generation but in perpetuity for the next generation and the next and so on, (always).*

- Below are provided three (3) examples we have included which explains what **Intergenerational Equity** represents;
- Intergenerational equity:** A core proposition is that future generations have a right to an inheritance (capital bequest) sufficient to allow them to generate a level of well-being no less than that of the current generation. Also refers to fairness in the treatment of different members of the same generation.²²
 - Intergenerational equity:** Meeting the needs of the present without compromising the ability of future generations to meet their own needs.²³
 - Inter-generational equity:** The principle of equity between people alive today and future generations. The implication is that unsustainable production and consumption by today's society will degrade the ecological, social, and economic basis for tomorrow's society, whereas sustainability involves ensuring that future generations will have the means to achieve a quality of life equal to or better than today's.²⁴

Awabakal Traditional Owners Aboriginal Corporation

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCS recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

Awabakal Local Aboriginal Land Council

ALALC understands the concept of Intergenerational Equity and can see that currently WWC cannot demonstrate Intergenerational Equity for the Bangalow Creek Grinding Grooves 1 through 7 and the #38-4-0461 and #38-4-0462 grinding groove sites as there are no other grinding groove sites like these on the western fall of the Sugarloaf Range that are guaranteed long term conservation. We also can see that Intergenerational Equity cannot be demonstrated for the Diega Creek Grinding Groove sites if WWC is going to crack them all. We understand that through the monitoring process and further survey that WWC will seek to meet the requirements of Intergenerational Equity and if they can't that they will have to make revisions to what they are currently planning to be their management strategy for these sites (ALALC 8 April 2010).

Koompahtoo Local Aboriginal Land Council

KLALC understands that Intergenerational Equity applies to leaving a representative sample of sites for the future. KLALC also understands that it

²² From Website 'www.traditionalknowledge.info/glossary.php'

²³ From Website 'www.konsult.leeds.ac.uk/public/level1/sec17/index.htm'

²⁴ From Website 'www.ic.gc.ca/eic/site/ee-ee.nsf/eng/h_ef00016.html'

means letting people that are here today have access to resources of coal but not using it all up and leaving none for the future.

WWC has three extremely highly significant grinding groove sites within their mine area that are within our LALC area. WWC has changed its mine plan to protect two of these sites and made some changes to lessen impact on the third. So Intergenerational Equity within our LALC is being met (even though we don't want to see Palmers Creek 3 Grinding Grooves impacted either). However, we think that it would not be equitable for WWC to crack all the grinding groove sites on Diega Creek and we can also see that it would not be equitable to impact the Bangalow Creek Grinding Groove sites without first finding out if there are more sites like those outside the mine that can be conserved into the future. All of these sites are within ALALC boundaries and so KLALC will support whatever ALALC says in terms of Intergenerational Equity for the sites in their area (Lois Towney of KLALC - comments from meeting 9 March 2010).

Cacatua Cultural Consultants

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

8.6.4 Summary Intergenerational Equity

In summary, it is assessed that the management options discussed in **Sections 8.2 to 8.5** have the potential to provide for Intergenerational Equity if the management strategy proposed is implemented including the additional offsets proposed by the registered Aboriginal stakeholders. The requirement for any revision of the management strategy and the extent of any revisions will only be known when the proposed survey is completed (in relation to the Bangalow Creek grinding groove sites) and the nature and potential for the long-term conservation of any sites located has been assessed and when the monitoring of the impacts of subsidence on the Diega Creek Grinding Grooves 2 to 6 sites are known.

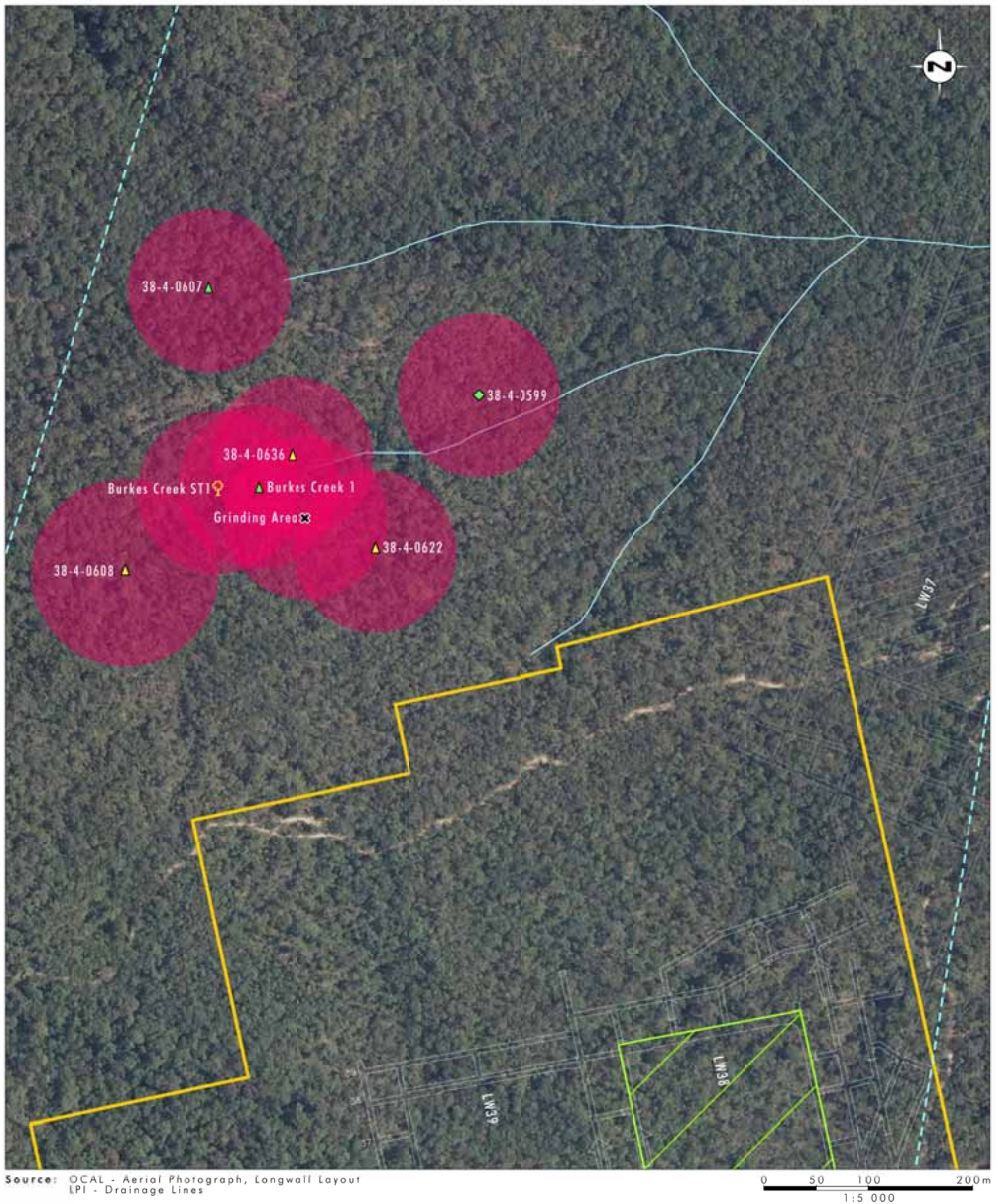
8.7 Impacts of Intergenerational Equity Requirements on Mine Feasibility and Further Site Offsets

As noted in **Section 8.2.3**, the feasibility of WWC continued underground mine operations will be severely diminished if the Diega Creek Grinding Grooves 1 site cannot be undermined in the event of the majority of the other Diega Grinding Groove Sites (2 through 6) cracking following subsidence. The location of the Diega Creek Grinding Grooves 1 site within the central-southern section of the proposed continued underground mining area above Longwall 49 places it in an area that is critical for the mining project.

In order to gain certainty for the undermining of the Diega Creek Grinding Grooves 1 site, WWC committed to protecting (through preventing subsidence impacts) a further five previously recorded sets of grinding grooves (one of which was recorded as having the potential to contain an engraved macropod footprint). These sites are located on tributaries of Burkes Creek which is located on the eastern fall of the Sugarloaf Range and in a similar environmental context to the Diega Creek Grinding Groove sites (refer to **Figure 8.1**). The sites are within WWC's ML 1451.

The sites include:

- #38-4-0607 Grinding Grooves;
- #38-4-0608 Grinding Grooves;



Legend

 Continued Underground Mining Area	x Feature of Aboriginal Cultural Value
 Proposed Underground Workings in the West Borehole Seam	▲ Scarred Tree
 Longwall Progression as of 1st March 2010	Site Significance Level:
 Former Underground Workings	 Moderate
— Drainage Line	 Low-Moderate
- - - ML1451 Lease Boundary	Aboriginal Site Significance:
▲ Axe Grinding Groove	 Extremely High
◆ Axe Grinding Groove with possible Art	

File Name (A4): R03_V1/2553_313.dgn

FIGURE 8.1

Aboriginal and Archaeological Significance of Sites within ML 1451 Proposed for Protection from Mining as a Conservation Offset

- #38-4-0622 Grinding Grooves;
- #38-4-0636 Grinding Grooves; and
- #38-4-0599 Grinding Grooves with Possible Art (Engraving).

In order for WWC to demonstrate that the protection of the five sites would meet with the requirements of Intergenerational Equity and be a suitable offset from an Aboriginal stakeholder and DECCW perspective (in order to balance any damage that may occur to Diega Creek Grinding Grooves 1 site); WWC was required to provide funding for the inspection, recording and Aboriginal cultural heritage and archaeological significance assessments of the five sites.

The sites were inspected by ADTOAC, ATOAC and ALALC representatives and Umwelt archaeologists on 13 April 2010. During the site inspection an additional previously unrecorded grinding groove site (Burkes Creek Grinding Grooves 1), a scarred tree (Burkes Creek ST1) and a landscape feature of Aboriginal cultural significance (depressions on sandstone in creekline) were located and recorded. Full details of the new and previously recorded sites and the landscape feature are provided in **Appendix K. Table 8.1** provides a summary of the grinding groove site attributes (the scarred tree and landscape feature are not included as they are not relevant to the current assessment of Intergenerational Equity – however, a site card will be provided to the DECCW for the scarred tree (refer to **Section 9.4** and **Appendix H**). Information in relation to Diega Creek Grinding Grooves 1 is also included in **Table 8.1** for comparative purposes (refer to **Figure 5.4** for the location of Diega Creek Grinding Grooves 1).

It should be noted that the #38-4-0599 Grinding Groove with Possible Engraving site was not found to have any evidence of engraving. It is unclear if this may be the result of erosion since the initial recording of the site. However, as the site is recorded as ‘#38-4-0599 Grinding Groove with Possible Engraving’ this name has been retained for clarity.

Table 8.1 - Summary of Grinding Groove Sites

Site Name	Context	# Grooves	Type of Grooves	Approximate Time for Grinding (Hours)	Visits M=multiple S=single	Preservation	Associated Surface Artefacts	Associated Subsurface Artefacts/ PAD
Diega Creek Grinding Groove 1	sandstone bench – upper creek catchment	27+	axe, hatchet	100+	M	fair to good	0	N/A
#38-4-0599 Grinding Grooves with Possible Art (Engraving)	sandstone bench – upper creek catchment	4	axe	25	M	fair to good	0	N/A
#38-4-0607 Grinding Grooves	sandstone bench – upper creek catchment	5	hatchet, adze	13	M	poor	0	N/A
#38-4-0608 Grinding Grooves	sandstone bench – upper creek catchment	7	axe, hatchet	24	M	poor to good	0	N/A
#38-4-0622 Grinding Grooves	sandstone bench – upper creek catchment	5	axe, spear	22+	M	fair to good	0	N/A
#38-4-0636 Grinding Grooves	sandstone bench – upper creek catchment	2	axe, hatchet	14	M	good	0	N/A
Burkes Creek Grinding Grooves 1	sandstone bench – upper creek catchment	2	hatchet	8	M	good	0	N/A
Total = 7 sites	All sandstone benches, platforms, creekbeds in upper catchments of creeklines	51	axes, hatchets, adze, spear points	200 hours Minimum time estimated for production of grooves	7 sites multiple visits, 0 sites single visit	Good = 2 Fair = 0 Poor = 1 Poor to good = 1 Fair to good = 3	0	N/A = 7 PAD = 0

Table 8.2 provides the Aboriginal cultural and archaeological significance of the grinding groove sites. Once again Diega Creek Grinding Grooves 1 is included for comparative purposes. Please note that CCC (17 June 2010) requested its comments be removed from **Table 8.2** (refer to **Appendix J**) and that KLALC was not involved as the Burkes Creek sites are in the ALALC boundary.

Table 8.2 - Aboriginal Cultural and Archaeological Site Significance

Site Name	Aboriginal Cultural Significance	Overall Archaeological Significance
Diega Creek Grinding Grooves 1	ADTOAC – Extremely high ATOAC - Extremely high ALALC – Extremely high	Moderate
#38-4-0599 Grinding Grooves with Possible Art (Engraving)	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Low to Moderate
#38-4-0607 Grinding Grooves	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Low to Moderate
#38-4-0608 Grinding Grooves	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Moderate
#38-4-0622 Grinding Grooves	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Moderate
#38-4-0636 Grinding Grooves	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Moderate
Burkes Creek Grinding Grooves 1 (new site)	ADTOAC – Extremely high ATOAC - Extremely high ALALC – no comment provided	Low to Moderate

Based on the attributes of the Burkes Creek Grinding Grooves 1 site, the #38-4-0607, #38-4-0608; #38-4-0622 #38-4-0636 Grinding Groove sites and the #38-4-0599 Grinding Grooves with Possible Art (Engraving) site and even taking into account their extremely high Aboriginal cultural significance it is assessed that (refer to **Appendix K** for details of the Aboriginal stakeholder comments):

- the protection of the sites from future mining will not meet the requirements of Intergenerational Equity; and
- that the protection of these sites will not act as an appropriate offset for potential damage that may be incurred by undermining of the Diega Creek Grinding Grooves 1 site..

Based on the attributes of the Burkes Creek Grinding Grooves 1 site, the #38-4-0607, #38-4-0608; #38-4-0622 #38-4-0636 Grinding Groove sites and the #38-4-0599 Grinding Grooves with Possible Art (Engraving) site and their moderate and low to moderate archaeological significance and low to moderate research potential it is assessed from an archaeological perspective that (refer to **Appendix K** for details of the archaeological significance rankings):

- the protection of the six sites from future mining will meet the requirements of Intergenerational Equity; and
- that the protection of these six sites will act as an appropriate offset for potential damage that may be incurred by undermining of the Diega Creek Grinding Grooves 1 site.

In summary, although it is assessed from an archaeological perspective the protection of #38-4-0607, #38-4-0608; #38-4-0622 #38-4-0636 Grinding Groove sites and the #38-4-0599 Grinding Grooves with Possible Art (Engraving) site as an offset for any damage incurred to the Diega Creek Grinding Grooves 1 site does meet the requirements of Intergenerational Equity it has been made clear by the registered Aboriginal stakeholders that they do not feel that the protection of these sites demonstrates Intergenerational Equity in relation to the potential for damage to the Diega Creek Grinding Grooves 1 site and that their protection is not a suitable offset.

Therefore the Aboriginal stakeholders have requested that if despite their comments the proposed WWC continued underground mine project is approved that the management strategy reverts to that proposed in **Section 8.2.3**; which they previously endorsed as being the least objectionable management outcome if WWC obtains Project Approval. **Section 8.2.3** proposed that if more than 50% of the Diega Creek Grinding Grooves 2 to 6 sites were cracked by subsidence that WWC would be required to revise the management strategy in consultation with the relevant registered Aboriginal stakeholders and to the satisfaction of the DECCW and DoP. Revisions to the management strategy could include, but should not be limited to, site conservation or further survey to locate other sites that **may** be more appropriate offsets.

In light of the Aboriginal stakeholder comments WWC do not propose to utilise the management option of protecting the Burkes Creek sites but would like to retain the option to conserve the Burkes Creek area for future assessment if deemed appropriate by the registered Aboriginal stakeholders, DECCW and DoP.

8.8 Request for Additional Offset Options

WWC has committed to the provision of \$25,000 in funding towards each of the requested additional offsets for cultural heritage projects put forward by the registered Aboriginal stakeholders (refer to **Appendix L** for additional offsets proposed and WWC's commitments). This commitment has been reached having considered the total offset package strategy proposed by WWC and the comments provided by the registered Aboriginal stakeholders in the working and final draft report in relation to:

- the Aboriginal cultural significance/value of the proposed continued underground mining area and the Aboriginal archaeological sites and landscape features it contains (refer to **Sections 1.1, 3.0, 6.1 and Appendix J and K**);
- the comments provided in relation to the management options (refer to **Sections 8.1 to 8.5 and 8.7**); and
- the requirements of demonstrating Intergenerational Equity (refer to **Section 8.6**).

The commitment to providing the additional offsets forms part of the overall management strategy presented in **Section 9.0**. Details of the offsets proposed are not provided with the main text of the report as a number of the registered Aboriginal stakeholder groups requested that this information be restricted. The details are provided in **Appendix L** which will be provided to the Aboriginal stakeholders, DoP, DECCW and WWC.

The following comments were provided in response to WWC's commitment to the additional offsets by the Aboriginal stakeholders.

ADTOAC (6 June 2010) provided a detailed response to WWC in relation to their additional offset proposal (refer to **Appendix L**). The following excerpts from the ADTOAC letter have been approved by ADTOAC for inclusion in the main text of the report. The excerpt reflects their overall response to the offer proposed by WWC:

... it is of great distress to ask for anything in return for the possible destruction of our Cultural Heritage sites but knowing the possibility of this proposal being given permission to proceed compels us to have the opportunity of leaving something for the future generations of Awabakal if this proposal to allow the continued underground mining operations of WWC is realised. We believed that the previously mentioned Additional Offset as proposed by ADTOAC and subsequently rejected by WWC of the acquisition of land that had similar Cultural Heritage values to those proposed to be undermined by WWC was considered by our People to have demonstrated the much needed Intergenerational Equity...

*... We were asked to attend a meeting with 2 representatives of WWC on Tuesday 18th May 2010 at their premises at Killingworth to discuss the WWC decision regarding our request for an additional offset (as outlined above). At this meeting it was conveyed to us that WWC had rejected our original request but would consider an alternate proposal ... After some discussion it was revealed that WWC was considering that a sum of \$25,000 dollars would be quite an adequate reimbursement (along with the other offsets) to compensate for any possible damage to our Cultural Heritage due to this continued underground mining proposed by WWC and would also help to satisfy the question with regard to **Intergenerational Equity**.*

*We must admit this is a disappointing result considering the possibility of what we as Awabakal People stand to lose in the ensuing years and what WWC stand to gain in the immediate future resulting in the very real possibility of the destruction and damage of, as it states in the draft, (...**cumulatively 73% of all sites and features identified as of Aboriginal cultural value within the continued underground mining area**)²⁵ to our Cultural Heritage.*

*With these facts in mind we present [refer to **Appendix L**] an alternate proposal for the additional offsets option for consideration by WWC which would include (but not be constrained or controlled by restrictions placed upon ADTOAC by WWC) realising the opportunity by ADTOAC to diversify the additional offset to cover more than one project as considered practicable and realistic at the time by ADTOAC and that will help to satisfy in a small way the question of **Intergenerational Equity**.*

*... Again there would need to be adequate and acceptable funding and resources provided by WWC (not just simply plucking a dollar figure out of the air like the \$25,000 on offer and saying this would be good enough) ... We believe the implementation and outcome of adequate funding for [our] project would be considered an absolute minimum part of a solution in addressing the question of **Intergenerational Equity** and the Additional Offset Options offered by WWC.*

²⁵ Draft Aboriginal Cultural Heritage and Archaeological Assessment, West Wallsend Colliery Continued Operations Project, 7.3 Methods Available for Mitigation of Direct Impacts, page 7.26

ALALC (9 June 2010 – refer to **Appendix B**) stated:

... we wish to state that we are not satisfied with the [additional] offsets outlined in the draft report; we believe that the offsets are unacceptable, because ALALC is a legally constituted Aboriginal organization with professional staff that represents the rights and interests of all Aboriginal people within the Newcastle and Lake Macquarie area. We are not representing one family or one to three individuals or a commercial enterprise set up for profit. We are non-profit organization with legal responsibilities and approximately 1500 members. Therefore, we feel it is unfair that we are offered the same level of offset as the three stakeholder groups.

As requested by ATOAC and CCC, their comments on the additional offsets are located in **Appendix J** and they are subsequently discussed in **Appendix L**. Both of these Appendices are for restricted viewing.

Due to the closure of KLALC prior to the finalisation of the discussions related to the additional offset requests, WWC has committed to providing the offset put forward by KLALC prior to its closure to the NSWALC who currently have responsibility for the former KLALC area (for details refer to **Appendix L**).

9.0 Management Strategy

The following management strategy has been prepared taking into account:

- the outcome of ongoing consultation with the registered Aboriginal stakeholders (refer to **Sections 1.1, 2.0, 3.1, 6.1 and 8.1 to 8.8 and Appendices A, B, J, K and L**);
- the outcome of consultation with the NPWS/DECCW (refer to **Section 2.7**);
- the results of a search of the DECCW AHIMS register and archaeological literature relating to the proposed continued underground mining area and its environs (refer to **Section 3.0**);
- the results of the survey (refer to **Section 5.0**);
- an assessment of the Aboriginal cultural heritage and archaeological significance of the proposed continued underground mining area and the sites and landscape features it contains and the subsurface archaeological material it can be predicted to contain (refer to **Section 6.0**);
- the results of a specialist arboricultural study (refer to **Section 5.3.6 and Appendix F**);
- an evaluation of the impacts of subsidence and subsidence remediation works proposed within the proposed continued underground mining area prepared by an independent geotechnical consultant (refer to **Section 7.0 and Appendix G**);
- an evaluation of available management/mitigation options from an Aboriginal cultural heritage and archaeological perspective (refer to **Section 8.0 and Appendix K**);
- an assessment of the management outcomes proposed taking into account Intergenerational Equity (refer to **Section 8.6 to 8.8 and Appendices B, K, J and L**); and
- consideration of an offset strategy to enable WWC to offset the loss of any Aboriginal cultural or archaeological values that may arise due to subsidence impacts and to demonstrate Intergenerational Equity without further modification to the mine plan (**Section 8.0 and Appendices B, J, K and L**).

9.1 Management Strategy for Aboriginal Archaeological Sites

A number of options to address the management aspects of the 49 Aboriginal archaeological sites within the proposed continued underground mining area were discussed and preferred options proposed from an Aboriginal cultural and archaeological perspective throughout **Section 8.0**.

9.1.1 Aboriginal Cultural Preferred Management Outcome

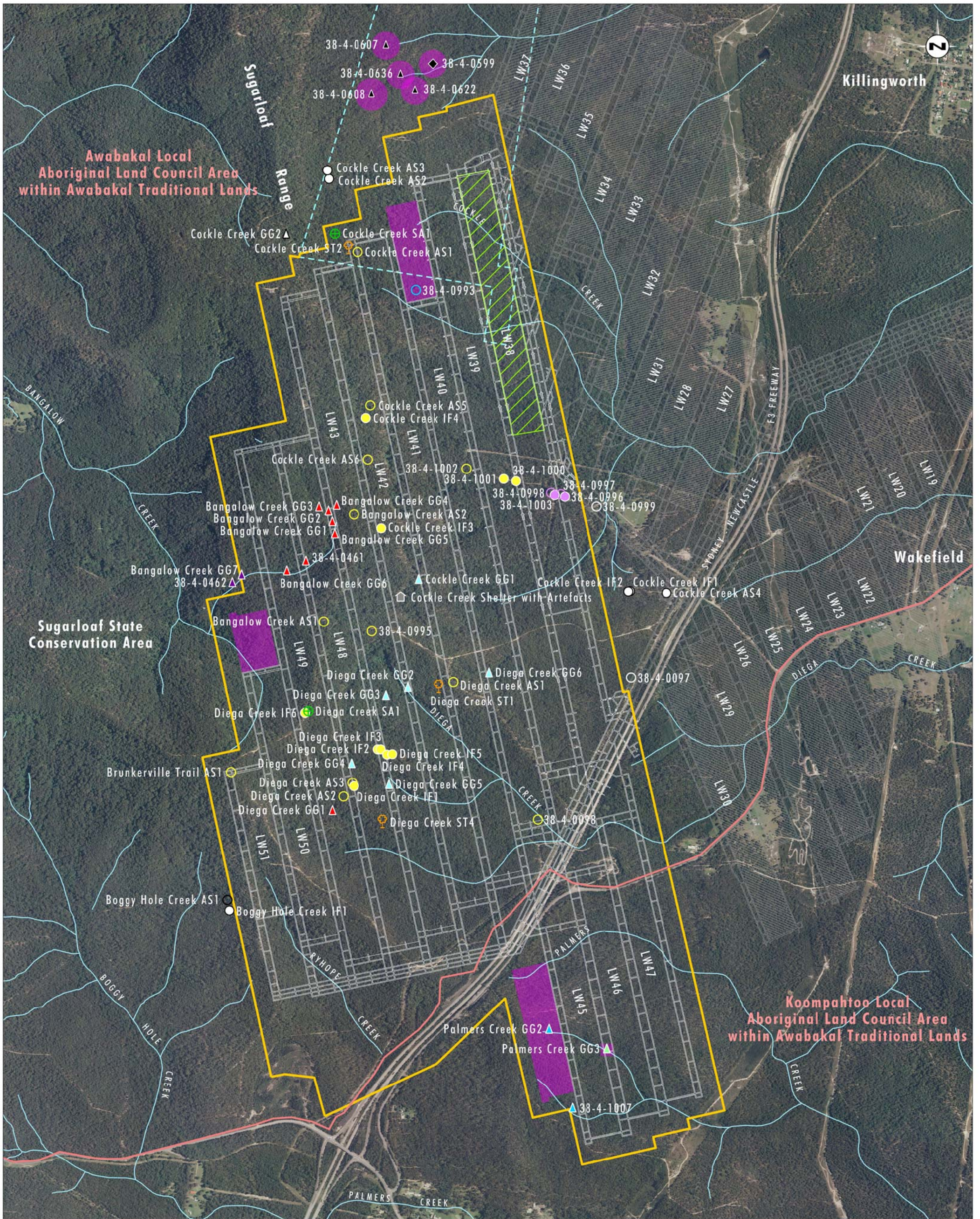
From an Aboriginal cultural perspective the only management option that was assessed as appropriate based on the extremely high Aboriginal cultural value of the Aboriginal archaeological sites was that no underground mining method be approved that has the potential to cause them damage.

The registered Aboriginal stakeholders advised that if WWC was still given approval for longwall mining despite their lack of support, the registered Aboriginal stakeholders considered management and mitigation measures that were considered the 'least

objectionable' for the Aboriginal archaeological sites should WWC obtain Project Approval for longwall mining (refer to **Section 8.1**).

In combination, these 'least objectionable' options aim to present a strategy for effective management of Aboriginal cultural heritage and archaeological sites/values in the context of the underground mining activity proposed (i.e. longwall extraction) within the proposed continued underground mining area. It is proposed that the management strategy be implemented in compliance with an ACHMP prepared by WWC in consultation with the relevant registered Aboriginal stakeholders, NPWS/DECCW and DoP (refer to **Section 9.4** for ACHMP outline and **Appendix H** for further details). **Table 9.1** details the management strategy for each of the Aboriginal archaeological sites within the proposed continued underground mining area and in its vicinity, along with a letter code that corresponds with the legend in **Figure 9.1**. **Figure 9.1** shows the sites colour-coded to indicate their proposed management strategy.

In light of comments received by the registered Aboriginal stakeholders and the requests of ADTOAC (4, 6 and 17 June 2010) and ATOAC (1 and 9 June 2010), it is once again highlighted that **Table 9.1 does not reflect the preferred management outcomes** (except where it allows for site conservation) from an Aboriginal cultural perspective. Instead it lists the 'least objectionable' management outcomes if longwall mining is approved.



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

FIGURE 9.1

Proposed Management Strategy of
Aboriginal Archaeological Sites

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites

Site Name	Management Strategy	#Sites	Code
Palmers Creek 1 Grinding Grooves (#38-4-1007)	No mitigation required as mine plan revised as an offset to avoid impacting Aboriginal cultural and archaeological values.	2	A
Palmers Creek Grinding Grooves 2	The sites will be protected throughout the life of the mine through protocols and procedures to be implemented under an ACHMP to be prepared in consultation with the relevant registered Aboriginal stakeholders and the NPWS/DECCW.	1	
Western Domain 5 (#38-4-0993 Artefact Scatter and wet soak)	The modification to the mine plan is proposed to offset potential damage to seven grinding groove sites in the proposed continued underground mining impact area including Cockle Creek Grinding Grooves 1 and Diega Creek Grinding Grooves 2 to 6 sites and the Palmers Creek Grinding Grooves 3 site and any damage to the other artefact scatters and isolated find sites.		
Palmers Creek Grinding Grooves 3	Mine plan has been revised to set aside two other sets of grinding grooves in the Palmers Creek catchment (Palmers Creek Grinding Grooves 1 and 2) as an offset for potential damage to this site. The chain pillar beneath this site has also been widened to lessen the probability of cracking. Mitigation to include monitoring by the relevant registered Aboriginal stakeholders and a qualified archaeologist following the cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence on the site. This information will be used to inform future assessments. AND • if required and if assessed as necessary by the relevant registered Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	1	B

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Bangalow Creek Grinding Grooves 1, Bangalow Creek Grinding Grooves 2, Bangalow Creek Grinding Grooves 3, Bangalow Creek Grinding Grooves 4, Bangalow Creek Grinding Grooves 5, Bangalow Creek Grinding Grooves 6, #38-4-0641 Grinding Grooves	In order to demonstrate Intergenerational Equity WWC will provide funding for further survey within the SSCA by the registered Aboriginal stakeholders and an archaeologist and involvement of the registered Aboriginal stakeholders in the provision of information related to sites/site management gathered during the survey to the NPWS/DECCW for inclusion in the POM for the SSCA. The purpose of the survey is to confirm whether sites of similar nature and similar significance exist in the SSCA that can be managed for their long-term conservation as an offset for any damage that may occur to these sites as the result of subsidence. If Intergenerational Equity can be demonstrated and if the sites are to be undermined, mitigation will be undertaken in compliance with the ACHMP prepared for the proposed continued underground mining area and will include: - record and report to DECCW impacts of subsidence on sites to inform future assessments; - if required and if assessed as necessary by the relevant Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and - employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3. If Intergenerational Equity cannot be demonstrated by the results of the survey, the management strategy in relation to these sites will be reviewed in consultation with the relevant registered Aboriginal stakeholders, DoP and DECCW. The management strategy revisions may include further survey or other forms of appropriate offset.	7	C

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Diega Creek Grinding Grooves 1	In compliance with the protocols and procedures of the ACHMP (refer to Section 9.4 and Appendix H) to be prepared for the proposed continued underground mining area; prior to subsidence: - Diega Creek Grinding Grooves 2 to 6 sites will be monitored to assess the impacts of subsidence; - if more than 50% of the Diega Creek grinding Grooves 2 to 6 sites have cracked (i.e. 3 or more), WWC will revise their management strategy for the Diega Creek Grinding Grooves 1 site. Revisions may include (but should not be limited to) conservation of the site or further survey to locate suitable sites to act as an offset in terms of Intergenerational Equity. If Intergenerational Equity can be demonstrated and if the site is to be undermined, mitigation will be undertaken in compliance with the ACHMP prepared for the proposed continued underground mining area and will include: - record and report to DECCW impacts of subsidence on site to inform future assessments; - if required and if assessed as necessary by the relevant Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and - where practical, implementation of appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	1	C
Cockle Creek Rockshelter with Artefacts and PAD	In compliance with the protocols and procedures of the ACHMP (refer to Section 9.4 and Appendix H) to be prepared for the proposed continued underground mining area and using the Research Design and Methodology in Appendix I, prior to subsidence: - undertake a detailed archaeological salvage of approximately 30% of the floor deposit; and - install props (if feasible) to prevent roof fall; and - backfill excavated area. In compliance with the protocols and procedures of the ACHMP following subsidence: - record and report to DECCW impacts of subsidence on site to inform future assessments; - if necessary feasible and safe repair any cracks in the walls, floor or roof of the rockshelter in a culturally appropriate manner; - if feasible and safe, remove the roof props; and - if feasible and safe return the artefactual material recovered during the excavation. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	1	D

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Cockle Creek Grinding Grooves 1, Diega Creek Grinding Grooves 2, Diega Creek Grinding Grooves 3, Diega Creek Grinding Grooves 4, Diega Creek Grinding Groove 5, Diega Creek Grinding Groove 6	In recognition of modifications to the mine plan to avoid impact to the Palmers Creek Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the widening of the chain pillar under Palmers Creek Grinding Grooves 3 – underground mining may be undertaken in the vicinity of the 6 grinding groove sites. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following subsidence to record and report to DECCW any impacts of subsidence on the sites. This information will be used to inform future assessments. AND • if required and if assessed as necessary by the relevant registered Aboriginal stakeholders - repair cracking of sandstone/grooves in a culturally appropriate manner; and • employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline. AND • WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	7	E

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Bangalow Creek AS1, Bangalow Creek AS2, Cockle Creek AS1, Cockle Creek AS5, Cockle Creek AS6, Diega Creek AS1, Diega Creek AS2, Diega Creek AS3 Western Domain 6 (#38-4-1000) (AS), Western Domain 7 (#38-4-1001) (AS), Western Domain 8 (#38-4-1002) (AS), #38-4-0098 AS, Brunkerville Trail AS1* , GNW1 (#38-4-0995) Cockle Creek IF3, Cockle Creek IF4 Diega Creek IF1, Diega Creek IF2, Diega Creek IF3, Diega Creek IF4, Diega Creek IF5, Diega Creek IF6	In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to these artefact scatter and isolated find sites; undermining will be endorsed for the sites. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. AND • if remediation works are required collect any surface artefacts or artefacts exposed by cracking ; • use imported fill to fix cracks to avoid impacting subsurface artefacts; and • replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3. *ADTOAC to provide WWC and DECCW with information in relation to culturally significant feature near the Brunkerville Trail site. This feature will be managed through the ACHMP and specifically through the monitoring program in a culturally appropriate manner.	14	F
		8	

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Western Domain 2 (#38-4-0997) (AS), Western Domain 3 (#38-4-0998) (AS)	These sites have already been surface collected under Section 87 AHIP #1098480. In recognition of modifications to the mine plan to avoid impact to the Western Domain 5 #38-4-0993 site and the low likelihood/level of impact to these artefact scatter and isolated find sites; undermining will be endorsed for the sites.	2	G
Western Domain 1 (#38-4-0996) (IF) Western Domain 9 (#38-4-1003) (IF)	Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. AND - if remediation works are required collect any artefacts exposed by cracking ; - use imported fill to fix cracks to avoid impacting subsurface artefacts; and - replace artefacts in an area nearby but not on the track/exposure following completion of subsidence remediation works. AND - WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	2	
Cockle Creek Stone Arrangement 1 Diega Creek Stone Arrangement 1	In recognition that subsidence is highly unlikely to impact these sites undermining will be endorsed. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. AND - prior to subsidence photograph stone arrangement from all angles; - prior to subsidence prepare a scale plan of stone arrangement; - following subsidence in the unlikely event that there is any movement of the stones in the arrangement use scale plan to assist the registered Aboriginal stakeholders to replace the stones in their proper arrangement; and - any topsoil crack remediation will be accomplished manually using imported fill so that no impact is occasioned to the stone arrangements. AND - WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	2	H

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Cockle Creek Scarred Tree 2 Diega Creek Scarred Tree 1 Diega Creek Scarred Tree 4	In recognition that subsidence is highly unlikely to impact the scarred trees undermining will be endorsed. Mitigation to include monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments. • prior to subsidence the scarred trees are carefully recorded for future reference (as scarred trees have a finite life span ongoing preservation in the landscape is not feasible but a photographic record and scale drawing can assist with making information about them available for future generations); and • following subsidence any repairs to topsoil cracking within the area of the scarred trees to be undertaken manually using imported fill in a manner that avoids impact to the scarred trees. AND • WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	3	I
Cockle Creek Grinding Grooves 2	No management applicable – Outside Continued Underground Mining Area or Outside Continued Underground Mining Impact Area	1	J
Boggy Hole Creek AS1		6	
Cockle Creek AS2			
Cockle Creek AS3			
Cockle Creek AS4	No management applicable – Outside Continued Underground Mining Area or Outside Continued Underground Mining Impact Area		J
Western Domain 4 AS (#38-4-0999)			
#38-4-0097 AS			
Boggy Hole Creek IF1			
Cockle Creek IF1	No management applicable – Outside Continued Underground Mining Area or Outside Continued Underground Mining Impact Area	3	J
Cockle Creek IF2			

Table 9.1 - Management Strategy for Aboriginal Archaeological Sites (cont)

Site Name	Management Strategy	#Sites	Code
Bangalow Creek Grinding Grooves 7 #38-4-0642 Grinding Grooves and Associated Rockshelter,	These sites are located outside the proposed continued underground mining area (#38-4-0642 Grinding Grooves and Associated Rockshelter) and outside the proposed continued underground mining impact area (Bangalow Creek Grinding Grooves 7). They are however in an area where indirect impact may occur if additional sediment is added to the creekline due to subsidence cracking upstream. Therefore, if mining of the Bangalow Creek Grinding Groove sites upstream is approved following further survey in the SSCA or through some alternative offset strategy; the following mitigation will be employed in compliance with the protocols and procedures of the ACHMP: • monitoring by the registered Aboriginal stakeholders and a qualified archaeologist following cessation of all subsidence impacts to record and report to DECCW any impacts of subsidence/subsidence remediation on the sites. This information will be used to inform future assessments and • (if required) employ appropriate erosion/remediation controls upstream to prevent the addition of sediment load to creekline that may impact/bury these sites. AND • WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	2	K

Seven principal management outcomes are included in the strategy for the management of Aboriginal archaeological sites within the proposed continued underground mining area if longwall mining is approved (these are detailed in **Table 9.1**). It is recommended that the management strategy be implemented as a staged process as longwall mining progresses and in compliance with an ACHMP prepared in consultation with the relevant registered Aboriginal stakeholders, NPWS/DECCW and approved by DoP (refer to **Appendix H**).

The management outcomes proposed for Aboriginal archaeological sites are as follows (for site locations colour-coded by their proposed management outcome refer to **Figure 9.1**). The conservation offsets mentioned are detailed in **Section 9.3**.

WWC has committed to;

- modification of the mine plan to protect the Palmers Creek 1 Grinding Grooves 1 #38-4-1007 and Palmers Creek Grinding Grooves 2 sites and the Western Domain 5 (#38-4-0993 - wet soak with artefact scatter site);
- modification of the mine plan to lessen the probability of impact to the Palmers Creek Grinding Grooves 3 site. AND mitigation of impacts due to subsidence (if any);
- prior to undermining of the Diega Creek Grinding Grooves 1 site to monitor the impacts of subsidence on the Diega Creek Grinding Grooves 2 to 6 sites and if more than 50% of these sites are cracked following subsidence to revise the management strategy in relation to Diega Creek Grinding Grooves 1;
- prior to undermining the manual excavation of 30% of the deposit from the Cockle Creek 1 Rockshelter with Artefacts and PAD and the propping of the roof of the rockshelter (if safe and feasible); and following subsidence repairs to any cracks in the walls, floor and roof (if necessary safe and feasible) and the return of any excavated material (if safe and feasible);
- prior to undermining the preparation of a photographic record and scale drawing of the two stone arrangement sites. Following undermining the inspection of the stone arrangements and if any movement of stones has been caused by subsidence, the registered Aboriginal stakeholders to replace the stones in their original arrangement. Any remediation works in the area to consist of infilling cracks in the topsoil with imported fill to avoid further site impact;
- prior to undermining the preparation of a photographic record and scale drawing of three scarred tree sites. Following undermining the inspection of the three Aboriginal scarred trees and the infilling of any cracks in the topsoil caused by subsidence with imported fill; and
- the provision of offsets for potential loss of Aboriginal cultural and archaeological values that may arise due to subsidence within the proposed continued underground mining impact area (refer to **Section 9.3**); AND if required following subsidence, the mitigation of any subsidence impacts using protocols and procedures detailed in an ACHMP prepared in consultation with the relevant registered Aboriginal stakeholders and the DECCW and as described in **Table 9.1**).

9.2 Landscape Features of Aboriginal Cultural Value

During the survey 17 landscape features were identified by the registered Aboriginal stakeholders as having particular cultural value. Eight of these have the potential to be adversely impacted by subsidence.

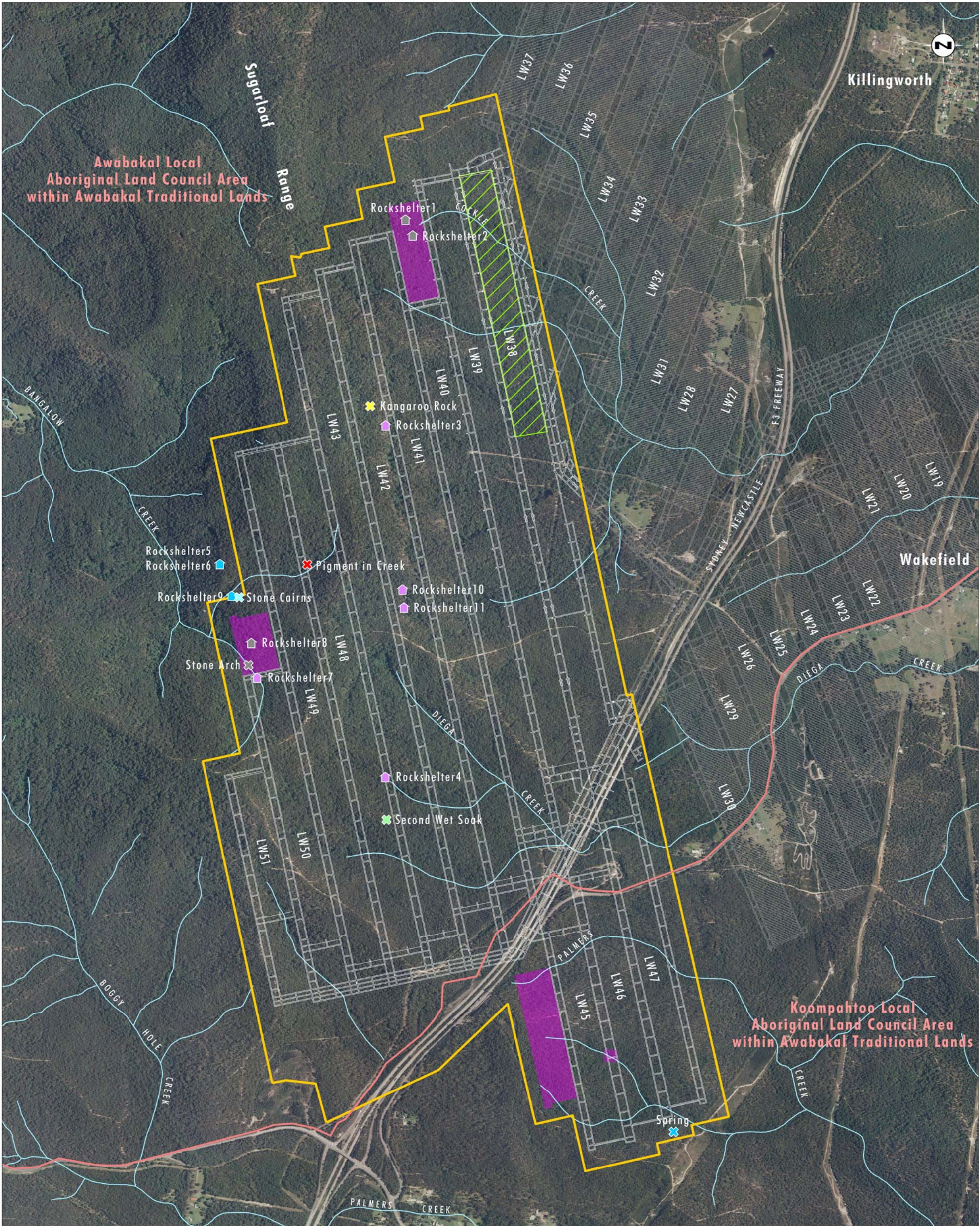
9.2.1 Aboriginal Cultural Preferred Management Outcome

From an Aboriginal cultural perspective the only management option that was assessed as appropriate based on the high Aboriginal cultural value of the landscape features was that no underground mining method be approved that has the potential to cause them damage.

Based on an understanding by the registered Aboriginal stakeholders that WWC may obtain approval for longwall mining despite their lack of support, the registered Aboriginal stakeholders considered management and mitigation measures for the landscape features that were considered the 'least objectionable' should WWC obtain Project Approval for longwall mining (refer to **Section 8.1**).

In combination, these 'least objectionable' options aim to present a strategy for effective management of Aboriginal cultural heritage landscape values in the context of the underground mining activity proposed (i.e. longwall extraction) within the proposed continued underground mining area. It is proposed that the management strategy be implemented in compliance with an ACHMP prepared by WWC in consultation with the relevant registered Aboriginal stakeholders, NPWS/DECCW and DoP (refer to **Section 9.4** for ACHMP outline and **Appendix H** for further details). **Table 9.2** details the management strategy for each of the landscape features within the proposed continued underground mining area (for landscape locations refer to **Figure 9.2**).

In light of comments received by the registered Aboriginal stakeholders and the requests of ADTOAC (4, 6 and 17 June 2010) and ATOAC (1 and 9 June 2010), it is once again highlighted that **Table 9.2 does not reflect the preferred management outcomes** (except where it allows for landscape feature conservation) from an Aboriginal cultural perspective. Instead it lists the 'least objectionable' management outcomes if longwall mining is approved.



Source: OCAL - Aerial Photograph, Longwall Layout
LPI - Drainage Lines

0 0.25 0.5 1km
1:20 000

Legend

- Continued Underground Mining Area
- Longwall Progression
- LALC Boundary
- Proposed Underground Workings
- Former Underground Workings
- Drainage Line
- Revised Layout for Archaeology and Groundwater

- Feature of Aboriginal Cultural Value
- Rockshelter

Management Strategy (refer to Table 9.1 of Report)

- A
- B
- C
- D
- E
- F
- G

FIGURE 9.2

Proposed Management Strategy of Landscape
Features of Aboriginal Cultural Value

Table 9.2 - Management Strategy for Landscape Features of Aboriginal Cultural Value

Landscape Feature	Management Strategy	# sites	Code
Spring	No mitigation options required as this landscape feature is outside the impact zone.	1	A
Wet Soak (2)	Offset has been supplied by modification of mine plan to avoid impact to the Western Domain 5 wet soak. In addition, in compliance with the protocols and procedures of an ACHMP: - if necessary following subsidence any cracks in the base of the wet soak are to be infilled manually using imported fill; - following subsidence the wet soak is monitored to ensure that no additional sediment load has been added to the waterflow that could act to infill the depression; - if necessary and feasible, erosion control works are implemented upslope to control any additional sediment load to the wet soak caused by subsidence. AND - WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	1	B
Pigment in Bangalow Creek	In compliance with the protocols and procedures of an ACHMP: - following subsidence the registered Aboriginal stakeholders are afforded the opportunity to collect any loosened fragments of clay pigment; and - the clay pigment will be used by the Aboriginal stakeholders for teaching purposes. AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3 .	1	C
Stone Arch	Mine plan modified to avoid impact, thus no mitigation option required.	1	D
Stone Cairns/Stacks	In compliance with the protocols and procedures of an ACHMP: - prior to subsidence the stone cairns/stacks are photographed from all angles; and - following subsidence if any movement of the stones in the cairns/stacks has been caused by subsidence the registered Aboriginal stakeholders should replace the stones in their proper arrangement using photographs as a guide AND WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3 .	1	E
Kangaroo Rock	No mitigation options required as rock will not be directly impacted by subsidence as it is free standing; however: - following subsidence any cracks near the base of the rock are to be infilled manually using imported fill. AND - WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	1	F

Table 9.2 - Management Strategy for Landscape Features of Aboriginal Cultural Value (cont)

Landscape Feature	Management Strategy	# sites	Code
Rockshelters 1, 2 and 8	No mitigation options required as mine plan modifications will mean impact will be avoided.	3	D
Rockshelters 3, 4, 7, 10, 11 (without archaeological evidence)	In compliance with the protocols and procedures of an ACHMP: - if necessary following subsidence any cracking of the roof, walls or floor will be repaired in a culturally appropriate manner where safe and feasible. AND - WWC to fund and implement the Conservation Offset Strategy set out in Section 9.3.	5	G
Rockshelters 5, 6, 9 (without archaeological evidence)	No mitigation options required as these landscape features are outside the impact area.	3	A

Six principal management outcomes are included in the strategy for the management of the landscape features of cultural value. WWC has committed to:

- modification of the mine plan to protect the stone arch and one rockshelter site in the Bangalow Creek catchment and two rockshelter sites in the Cockle Creek catchment;
- following subsidence the inspection of the second wet soak feature recorded in the Diega Creek catchment and the infilling of any cracks caused by subsidence with imported fill and if required and feasible, erosion control works upslope to prevent infilling of the wet soak if subsidence results in any slope destabilisation;
- following subsidence the collection of loose fragments of clay pigment (if any) from the pigment source identified by the registered Aboriginal stakeholders in the upper tributary system of Bangalow Creek;
- prior to subsidence two stone cairns/stacks in the Bangalow Creek catchment are photographed from each side. Following undermining the replacement of any stones dislodged during subsidence by the registered Aboriginal stakeholders using the photographs as a reference, and the infilling of any cracks caused by subsidence with imported fill;
- following subsidence the inspection of the boulder identified as 'Kangaroo Rock' and the infilling of any cracks in the topsoil caused by subsidence with imported fill; and
- following subsidence the inspection of the five known rockshelters (not recorded as Aboriginal archaeological sites) within the proposed continued underground mining area and repairs to the roof, walls and floor in a culturally appropriate manner (where necessary, safe and feasible).

Following undermining, information will be recorded in relation to the impacts of subsidence on the various landscape features. This information will be used to inform future underground mining projects. The details of how this information will be recorded/reported are discussed in **Section 9.3.3**).

9.3 Conservation Offset Strategy

WWC proposes a multi-faceted approach to providing a conservation offset strategy for its project. **Sections 9.3.1 to 9.3.5** outline the conservation offsets proposed by WWC as part of its overall management strategy which aims to meet the requirements of Intergenerational Equity and offset any loss of Aboriginal cultural heritage and archaeological values that may arise as an outcome of subsidence. The site and landscape feature locations are shown on **Figures 9.1 and 9.2**.

9.3.1 Mine Plan Modifications

WWC has committed to modifying its mine plans to avoid impact to the Palmers Creek 1 (#38-4-1007) and Palmers Creek 2 Grinding Groove sites and the Western Domain 5 (#38-4-0993 - wet soak with artefact scatter site). The mine modifications are proposed in recognition of the Aboriginal cultural value and archaeological significance of these sites.

The mine plan has also been modified to reduce the potential impact of subsidence on the Palmers Creek 3 Grinding Groove site from >25% to 5 to 15% probability of cracking in recognition of its Aboriginal cultural value and archaeological significance.

WWC has committed to modifying its mine plans to avoid impact to the 'stone arch'. This mine plan modification is proposed in recognition of the Aboriginal cultural value of this landscape feature.

The mine plan modifications have also acted to protect three rockshelters (Rockshelters 1, 2 and 8) recorded as landscape features of high Aboriginal cultural value.

The mine plan modifications proposed will sterilise 2.04 Mt of coal resource. This has a current economic value of \$150 million.

Following ongoing consultation with the registered Aboriginal stakeholders during the working draft and final draft report process it was assessed that WWC was not meeting the requirements of Intergenerational Equity in relation to one of the grinding groove sites (Diega Creek grinding Grooves 1). In order to address this inequity WWC also committed to protecting six additional grinding groove sites (Burkes Creek Grinding Groove 1, #38-4-0607, #38-4-0608; #38-4-0622, #38-4-0636 and #38-4-0599 Grinding Grooves and Possible Art) within ML 1451 from any future mining impacts as an offset for the potential loss of Aboriginal cultural and archaeological values associated with the undermining of Diega Creek Grinding Grooves 1. In protecting these sites WWC has also afforded protection to a newly recorded scarred tree (Burkes Creek ST1). However, this proposed offset has been rejected by the registered Aboriginal stakeholders (refer to **Section 8.7** and **Appendix K**). If longwall mining is approved the registered Aboriginal stakeholders have requested the initial management option put forward in the working draft report be implemented (refer to **Section 9.3.3** for details).

9.3.2 Funding for Management of Cultural Heritage in SSCA

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts within the proposed continued underground mining area, WWC has committed to providing \$200,000.00 over the life of the proposed continued underground mine project to assist with the management of Aboriginal cultural and archaeological sites/values within the SSCA.

WWC will set aside the \$200,000 prior to mining commencing and will administer the funds. The funds will be allocated on a project basis. All projects will be undertaken in consultation with the relevant registered Aboriginal stakeholders and the NPWS/DECCW.

9.3.3 Funding for Ongoing Monitoring/Reporting of Subsidence Impacts

To offset the potential loss of Aboriginal cultural and archaeological values that may arise as a result of subsidence impacts within the proposed continued underground mining area, WWC has committed to fund a program of monitoring and reporting of subsidence impacts on landscape features of Aboriginal cultural value and Aboriginal archaeological sites recorded within the proposed continued underground mining area.

It is proposed that following the cessation of subsidence related to each longwall WWC will fund an inspection of the subsided sites/landscape features of Aboriginal cultural heritage value in order to collect a detailed database on exactly how each of the sites is impacted. The inspection and reporting will be undertaken by the relevant registered Aboriginal stakeholders and a suitably qualified archaeologist. The purpose of the monitoring is threefold. Initially it is to observe:

- What percentage of the sites do/do not crack?
- What is the level and nature of the impact?

- How does this relate to the location of the site relative to longwalls/chain pillars and their situation (e.g. on a slope, on a sandstone bench, within a sandstone creek bed, in a cliffline, pre-existing cracking and jointing)?
- Does this information allow refinement of the predicted impacts and therefore management of subsidence on the sites within the proposed continued underground mining area?
- If so, does this information allow the revision of the management strategy for the remainder of the grinding groove sites for which subsidence is proposed?

The second aim of the monitoring is to provide a more detailed database for use for future mining assessments and to monitor the success of remediation works (where required) on all site types within the proposed continued underground mining area. This level of recording is rarely undertaken in relation to Aboriginal archaeological sites and landscape features of Aboriginal cultural value and will be extremely informative to WWC, registered Aboriginal stakeholders, archaeologists, NPWS/DECCW and DoP for undertaking and evaluating future assessments. A database of this nature would be an extremely valuable resource.

The third aim is to ensure compliance with the various aspects of the management strategy that relate to monitoring either before or after subsidence. In this regard it is proposed to record the:

- impacts of subsidence (if any);
- requirements for remediation (if any);
- nature and extent of the remediation works;
- suitability of the remediation works;
- success of remediation works; and
- project approval compliance.

It is proposed that full pictorial records will be prepared for each landscape feature/site to inform the reporting process for the DECCW and DoP.

One aspect of the monitoring process will be to ascertain if more than 50% of the Diega Creek Grinding Grooves 2 to 6 sites have been impacted by cracking due to subsidence. This monitoring will be undertaken prior to any longwall mining that may impact the Diega Creek Grinding Grooves 1 site. If more than 50% (3 or more) of these sites crack WWC has committed to revising its management strategy in consultation with the registered Aboriginal stakeholders and the NPWS/DECCW. Revisions to the management strategy may include conservation of the site or to further survey to locate other sites that could be conserved as an appropriate offset for any potential damage to Diega Creek Grinding Grooves 1.

9.3.4 Funding for Further Survey of the SSCA

For WWC to be able to meet the requirements of Intergenerational Equity without further modifications to the mine plan, WWC must demonstrate that Aboriginal archaeological sites of equal cultural heritage and archaeological significance and research potential to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites exist within the broader SSCA and outside of mine leases and that these sites can be managed in a culturally appropriate way that will ensure their long-term conservation and availability for teaching purposes to present and future generations of Awabakal people and Aboriginal

people that live in, and/or visit the area. In this regard WWC has committed to funding a program of survey within the SSCA in consultation with the registered Aboriginal stakeholders and the NPWS/DECCW. The information recorded during the survey will be provided to the NPWS/DECCW to assist in the preparation of the POM for the SSCA.

It is proposed that:

- during the approval process a meeting will be arranged by WWC with NPWS/DECCW, in consultation with ADTOAC, ALALC, ATOAC, CCC, NSWALC (an archaeologist may be included in this meeting if thought appropriate by WWC, ADTOAC, ALALC, ATOAC, CCC and NSWALC) to discuss:
 - WWC setting up a fund which they will administer for survey within the SSCA (outside the proposed continued underground mining area and outside ML areas);
 - the nature of the survey strategy; and
 - the requirements of the POM being prepared by the NPWS/DECCW for the SSCA so that the requisite information can be recorded during the survey;
- the survey will include at least 20 days of survey and recording of sites and landscape values/resources within the SSCA by the relevant registered Aboriginal stakeholders and an archaeologist (the breakdown of this time between the ALALC and KLALC boundaries will be subject to consultation between the Aboriginal stakeholder groups and WWC);
- funding will also be provided for the preparation and production of site cards (including the production of maps, plans, photographs); and
- following the completion of the survey and the compilation of the site cards, additional funding will be provided to commission a suitably qualified person to assist WWC to prepare a statement, in consultation with the relevant registered Aboriginal stakeholders, for provision to DoP and NPWS/DECCW in relation to the suitability (in terms of their Aboriginal cultural and archaeological significance and conservation value) of the sites located outside MLs and within the SSCA as an offset (in terms of Intergenerational Equity) for the impact predicted from subsidence to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves 3 sites.

WWC will commit to revising the management strategy for the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites if it cannot be demonstrated that:

- there are suitable sites outside the proposed continued underground mining area and outside MLs in the SSCA that can be managed/conserved into the future to meet the requirements of Intergenerational Equity for all or some of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites (this will be site specific and depend on the outcomes of the survey and further consultation with NPWS/DECCW).

The revisions to the management strategy may include further survey or alternative offsets assessed as appropriate from an Aboriginal cultural and archaeological perspective and endorsed by DECCW and DoP.

While the strategy above proposes a start date for the survey within 24 months of site impact, WWC may commence work on the strategy at an earlier date if it would prefer to know the outcome of the survey sooner and to obtain more certainty for the proposed continued underground mining project.

9.3.5 Additional Conservation Offsets

Each of the registered Aboriginal stakeholder groups has requested an additional cultural heritage conservation offset package which they assess as necessary for WWC to balance the requirements of Intergenerational Equity.

As some groups requested that the supply of details related to their additional offset requests be restricted to the Aboriginal stakeholders, WWC, NPWS/DECCW and DoP, the information has been included in **Appendix L** which will not be available for public review.

As part of its overall conservation offset strategy WWC has committed to the provision of \$25,000 to each of the registered Aboriginal stakeholders as an additional offset for specific cultural heritage projects (refer to **Appendix L** for additional offsets proposed and WWC's commitments).

9.4 Aboriginal Cultural Heritage Management Plan (ACHMP)

WWC will prepare an ACHMP for the project that is consistent with the Aboriginal cultural and archaeological management commitments made in this report. These management commitments should form part of the Statement of Commitments arising from the EA process. The ACHMP will provide detailed management strategies for all identified Aboriginal archaeological sites and landscape features of Aboriginal cultural value located within the proposed continued underground mining area.

The ACHMP will also review and revise as required/where appropriate, Aboriginal heritage management protocols from previous consents and approvals, to provide WWC with a single, consolidated framework for managing Aboriginal cultural heritage (for details please refer to **Appendix H**). The ACHMP will also clearly identify the responsibilities of all parties involved; WWC, registered Aboriginal stakeholders, archaeologists, NPWS/DECCW; and designate timeframes for required Aboriginal heritage management works.

The ACHMP will be in operation throughout the life of the proposed continued underground mining project. The aim of the ACHMP is to ensure WWC meet the requirements of the Project Approval which it is proposed should include a request for:

- details of the proposed implementation of, and methodology for, the conservation offset strategy;
- a detailed salvage program for Aboriginal archaeological sites within the proposed continued underground mining area including isolated finds, artefact scatters (if subsidence remediation works are required in the site areas) and the Cockle Creek Rockshelter with Artefacts and PAD (refer to **Appendix I** for a detailed Research Design and Methodology);
- a detailed description of the mitigation measures that would be undertaken for all Aboriginal archaeological sites and landscape features of Aboriginal cultural value within the proposed continued underground mining area prior to and/or following subsidence;
- a detailed description of the measures that would be implemented to protect Aboriginal archaeological sites and landscape features of Aboriginal cultural value for the life of the project;

- a detailed methodology for inspection of locations proposed for surface ventilation infrastructure construction and future exploration boreholes (for further details refer to **Section 9.6**);
- a description of the measures that would be implemented if any new Aboriginal sites/artefacts or skeletal remains are discovered during works associated with the Project;
- the provision of Aboriginal cultural awareness training for WWC personnel and for contractors as part of the induction process; and
- a protocol for the ongoing consultation and involvement of the Aboriginal stakeholder groups and NPWS/DECCW in the conservation and management of Aboriginal cultural heritage within the proposed continued underground mining area.

Appendix H provides more detailed descriptions of requirements proposed for the ACHMP.

Endorsement of the proposal for an ACHMP has been provided by the relevant registered Aboriginal stakeholders. Their comments are provided below.

ADTOAC do endorse the commitment to the ACHMP as long as it is based, at a minimum, upon the above outline and prepared with the assistance of Awabakal Traditional Owners/Descendants (ADTOAC 25 March 2010).

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCS recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

ALALC supports the ACHMP providing we are involved in its preparation and in the implementation of site management strategies for the area within our LALC boundaries (ALALC 11 March 2010).

KLALC endorses WWC's commitment to the ACHMP which we understand will be prepared based on the outline above and which we will be involved in preparing (Lois Towney of KLALC - comments from meeting 9 March 2010).

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

9.5 Care of Salvaged Artefacts

The following protocol for 'care' is based on a compromise between the wishes of the registered Aboriginal stakeholders and the archaeological requirements as it was not possible to obtain consensus.

Any artefacts collected/salvaged will be subject to a full attribute analysis prior to being returned to their specific site locations following completion of subsidence remediation works. Where it is possible to return the artefacts to the site immediately they will be analysed in the field and returned on the same day. Where works cannot be undertaken immediately they will be in the care of the archaeological consultant commissioned to assist the registered

Aboriginal stakeholders with the salvage program. Following completion of remediation works the artefacts will be returned to their specific site locations and placed in an area where they will be safe from further impact. Revised site cards will be provided to the DECCW. This will happen on an ongoing basis as mining progresses.

Comments in relation to care of the artefacts have been provided by the registered Aboriginal stakeholders. Their comments are provided below.

ADTOAC endorse the Methodology for a care of salvaged artefacts and the 100% return of all collected artefacts to their specific site locations or a safe area nearby ADTOAC also endorse the scientific analysis of the artefacts before their return (ADTOAC 25 March 2010).

Please refer to the 'ATOAC Recommendations & Mitigation Plan' document that is included in the Appendix. This Plan reflects ATOAC's assessment for the conservation recommendations based on the DECCS recommended approach consistent with the NPW Act. This Plan articulates our advice regarding this WWC proposed management option. The 'ATOAC Recommendations & Mitigation Plan' is not for public display.

Please note that the ATOAC Recommendations and Mitigation Plan is located in Appendix J. Appendix J is not available for public display.

ALALC does not support the full attribute analysis. ALALC thinks that any artefacts collected from artefact scatters and isolated finds should be placed back in a safe place nearby. ALALC would also like to retain a sample of the artefacts for teaching purposes or display (ALALC 11 March 2010).

As no artefacts are currently proposed for collection within KLALC's boundaries we will support whatever ALALC wants to do about care of the artefacts salvaged (Lois Towney of KLALC - comments from meeting 9 March 2010).

CCC (17 June 2010) comments are located in **Appendix J** (for restricted access).

9.6 Future Ventilation Infrastructure and Exploration Boreholes

In **Section 7.0** it was noted that it may be necessary for ventilation infrastructure to be built within the proposed continued underground mining area once mining has commenced. It is also probable that there will be a need for further exploration boreholes, even during the project approval process. It is proposed that once the areas proposed for impact have been identified that they will be inspected by the registered Aboriginal stakeholders and an archaeologist and that they will be situated whenever possible outside culturally sensitive areas/sites. If this is not possible a management outcome will be undertaken in compliance with protocols and procedures set out in the ACHMP to be prepared in consultation with the NPWS/DECCW and the registered Aboriginal stakeholders (refer to **Section 9.4** and **Appendix H**). Based on comments provided by the relevant registered Aboriginal stakeholders, it is noted that it may be necessary for WWC to undertake site salvage and/or provide an additional offset if a site of high Aboriginal cultural and archaeological significance/research potential cannot be avoided when it becomes necessary to construct future ventilation infrastructure or drill exploration boreholes (refer to **Section 8.5**).

9.7 Timeframes for Implementation of Management Strategy

Table 9.3 identifies the timeframes related to the implementation of the management recommendations that make up the management strategy. The table is generalised in nature as a detailed timeframe for each of the tasks required will be prepared in consultation with the registered Aboriginal stakeholders, the DECCW and the DoP as part of the ACHMP if WWC obtains approval for longwall mining (refer to **Appendix H**).

Table 9.3 - Timeframes for Implementation of the Management Strategy

Task	Timeframe
Ongoing discussions with NPWS/DECCW and the registered Aboriginal stakeholders in relation to funding for the survey within the SSCA (for details refer to Section 9.3.4).	During the EA approval process.
Preparation of the ACHMP for the proposed continued underground mining area (for details refer to Section 9.4).	The ACHMP must be prepared in compliance with the conditions of the Project Approval. Thus, while it can be commenced prior to the receipt of Development Approval it cannot be completed until all conditions of Approval are known. The ACHMP must be completed and approved by DoP prior to any subsidence that may impact an Aboriginal archaeological site within the continued underground mining area that is not covered by an existing SMP approval.
WWC to provide \$200,000 funding to assist with management of Aboriginal cultural and archaeological sites/values within the SSCA (for details refer to Section 9.3.2).	The money will be set aside by WWC within 12 months of Project Approval. The money will be administered by WWC and apportioned on a project related basis over the life of the proposed continued underground mining project.
Undertake all tasks required under the ACHMP that must be performed prior to impact by longwall extraction. Including further detailed recording of the Cockle Creek 1 and Diega Creek 1 Stone Arrangement sites and the Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4 scarred tree sites (for an outline of what these tasks are proposed to entail refer to Appendices H and I).	Following Project Approval and endorsement of the ACHMP by the NPWS/DECCW and DoP and prior to undermining that may impact the Cockle Creek 1 and Diega Creek 1 Stone Arrangement sites and the Cockle Creek ST2, Diega Creek ST1 and Diega Creek ST4 scarred tree sites.
Undertake all tasks required under the ACHMP that must be performed after impact by subsidence related to longwall extraction. Including surface collection of any artefact scatters and isolated finds in areas where subsidence remediation is required; repair of topsoil cracking, repair of rockshelter cracking (where necessary, safe and feasible), repair of grinding groove cracking, repair of stone arrangements and stone cairns/stacks and repair of the second wet soak (if required).	Following endorsement of the ACHMP by the NPWS/DECCW and DoP and on an ongoing basis as longwall extraction proceeds.

Table 9.3 - Timeframes for Implementation of the Management Strategy (cont)

Task	Timeframe
Following the cessation of all subsidence impacts related to each longwall the relevant registered Aboriginal stakeholders and an archaeologist will inspect all of the previously recorded Aboriginal archaeological sites and landscape features of cultural heritage value within the subsidence impact area. The outcomes of subsidence and the success of remediation works on the sites/landscape features will be recorded and reported to the DECCW. Where necessary revised site cards will be provided to the DECCW (for details refer to Section 9.3.3).	At the completion of undermining of each longwall and when subsidence related to that longwall has ceased and remediation works (where necessary) have been completed.
Inspect Diega Creek Grinding Grooves 2, 3, 4, 5 and 6. Based on the percentage of these sites that crack, undertake consultation with the registered Aboriginal stakeholders and the NPWS/DECCW in relation to the management strategy for Diega Creek Grinding Grooves 1 (refer to Section 9.3.3).	Following the completion of Longwall 48 and the cessation of subsidence in the area of Diega Creek Grinding Grooves 4 and prior to any potential for impact on Diega Creek Grinding Grooves 1.
Undertake survey within the SSCA (for details refer to Section 9.3.4).	At least 12 months prior to impact by subsidence on the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461, grinding groove sites.
Following survey of the SSCA, prepare a statement for provision to DoP and NPWS/DECCW in relation to the suitability of the ongoing conservation of the sites located outside the proposed continued underground mining area and within the SSCA to balance (in terms of Intergenerational Equity) the damage predicted from subsidence/subsidence remediation to the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461. This statement may recommend that subsidence of some/all of the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites can go ahead or that the management strategy in relation to these sites will need further revision to reach an outcome that is acceptable from an Aboriginal cultural and archaeological perspective and to NPWS/DECCW and DoP.	At least 12 months prior to impact by subsidence on the Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461, grinding groove sites and following consultation with NPWS/DECCW and the registered Aboriginal stakeholders in relation to the management of these sites for their long-term conservation.
Revise ACHMP to incorporate final management strategy for Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites. Obtain approval of revised ACHMP from DoP.	Following approval of final management strategy/strategies for Bangalow Creek 1, 2, 3, 4, 5, 6 and #38-4-0461 Grinding Grooves sites and prior to any impact to any of the sites from subsidence.

Table 9.3 - Timeframes for Implementation of the Management Strategy (cont)

Task	Timeframe
Undertake the salvage program for the Cockle Creek Rockshelter with Artefacts and PAD using the research design and methodology detailed in Appendix I and in compliance with the ACHMP as presented in Appendix H .	Following Project Approval and endorsement of the ACHMP by the NPWS/DECCW and DoP. The salvage program for the Cockle Creek Rockshelter with Artefacts and PAD should not be implemented until 12 months prior to impact by removal of LW42.
Undertake inspections of locations proposed for ventilation infrastructure to be built within the proposed continued underground mining area once mining has commenced and for further exploration boreholes where necessary. Inspection to be undertaken by relevant registered Aboriginal stakeholders and an archaeologist in compliance with ACHMP.	On an ongoing basis throughout the life of the proposed continued underground mine project.

10.0 References

- Australia ICOMOS. 1979. The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.
- Australian National Botanic Gardens Education Services 2000. *Aboriginal Plant Use & Technology*. Accessed on 9 September 2008.
http://www.anbg.gov.au/education/pdfs/aborigainal_plant_use_and_technology.pdf
- Awabakal Local Aboriginal Land Council, 2003. *RTA F3 to Branxton Aboriginal Cultural Heritage Assessment*. Unpublished report to the Roads and Traffic Authority, Appendix 2, Umwelt 2003b.
- Barkuma Neighbourhood Centre. 2003. *Aboriginal Cultural Heritage Assessment Proposed Highway Link: F3 Freeway to Branxton*. Unpublished report to the Roads and Traffic Authority, Appendix 2, Umwelt 2003b.
- Barrallier, F. 1802 Letter to C.F. Grenville. Banks Papers, Brabourne Collection. MS A78-3, Mitchell Library, Sydney.
- Black Creek Aboriginal Corporation. 2003. *Cultural Heritage Assessment of Proposed Highway Link F3 Freeway to Branxton*. Unpublished report to the Roads and Traffic Authority, Appendix 2, Umwelt 2003b.
- Botanic Gardens Trust, Sydney, Australia, site undated.
http://www.rbgsyd.nsw.gov.au/plant_info/Plant_databases
Cited 23 June 2009-06-24
- Bowdler, S and Gollan, K. 1982. *An archaeological survey of a proposed transmission line route between Tomago and Eraring, New South Wales*. Report to the National Parks and Wildlife Service of New South Wales, on behalf of ELCOM, Sydney
- Bowdler, S and Happ, G. 1982. *An archaeological survey of a proposed transmission line between West Wallsend and Tomago, New South Wales*. Report to the National Parks and Wildlife Service of New South Wales, on behalf of ELCOM, Sydney
- Bramble, C. 1981 *Relations between Aborigines and White Settlers in Newcastle & the Hunter District, 1804–1841, with Special Reference to the Influence of the Penal Establishment*. B.Litt. Thesis, University of New England, Armidale.
- Brayshaw, H 1986. *Aborigines of the Hunter Valley. A study of Colonial Records*. Scone and Upper Hunter Historical Society, Scone, NSW.
- Brayshaw McDonald Pty Ltd 1994. National Highway Extension F3 to New England Highway at Branxton, Hunter Valley, NSW. Working Pare No. 6. Connell Wagner Pty Ltd. Proposed Highway Link F3 Freeway to Branxton. Environmental Impact Statement. September 1994.
- Brayshaw, H C 2001. Proposed Highway Link F3 to Branxton Update of Archaeological Assessment. Report to the NSW Roads and Traffic Authority through Connell Wagner Pty Ltd. October 2001.
- Breton, W.H. 1833. *Excursions in NSW, WA and Van Diemen's Land (1830-1833)*. London.

- Bureau of Meteorology 2009. *Summary of Significant Severe Thunderstorm Events in NSW - 2006/07*. <http://www.bom.gov.au/weather/nsw/sevwx/0607summ.shtml>
Cited 24 June 2009.
- Dawson, R. 1830. *The Present State of Australia; A Description of the Country, its Advantages and Prospects, With Reference to Emigration: and a Particular Account of the Manners, Customs and Condition of its Aboriginal Inhabitants*. Smith, Elder and Co., London.
- Department of Environment & Climate Change (DECC) NSW 2008. The Vertebrate Fauna of Sugarloaf State Conservation Area.
- Department of Environment and Conservation 2004. *Interim Community Consultation Requirements for Applicants*. Released December 2004.
- Dickson, F P 1980. *Of Grinding Grooves*, Archaeology and Physical Anthropology in Oceania 15(3); 157-161.
- Ditton Geotechnical Services Pty Ltd (DGS) 2009. Subsidence Predictions and General Impact Assessment of the Proposed Western and Southern Domain Longwalls, West Wallsend Colliery. Unpublished report to Oceanic Coal Australia Limited September 2009.
- Donlon, D. and Brayshaw, H. 1986. *Archaeological Survey – F3 Freeway Proposed Link Road, Estelville to Wallsend, NSW*. Report to the Department of Main Roads through Sinclair Knight & Partners Pty Ltd.
- Ebsworth, H.T. 1826. *A letter book, kept at Sydney and Port Stephens*. ML MS B852.
- Fletcher, B. H., Cadell, T and Davies, W. 1975. *An Account of the English Colony in New South Wales*. Vol. 1. The Strand: London
- Greenway, Rev C C 1910. Kamilari Tribe: *Foods*. *Science of Man*. Vol. XII. No. 1. May 2, 1910. pp. 15-16.
- Gunson, N (ed.) 1974. Australian Reminiscences and Papers of L. E. Threlkeld: Missionary to the Aborigines 1824-1859, Vol I. Canberra: Australian Institute of Aboriginal Studies. Threlkeld to Bannister 4.9.1826, pp. 93-94.
- Hartley, D.T. 1995. *Men of Their Time. Pioneers of the Hunter River*. Aquila Agribusiness Pty Ltd, North Arm Cove, NSW.
- Haslam, P. 1985. Aboriginal History in the Hunter Region for Father Brian Walsh. Unpublished account dating to 10 March 1985.
- <http://www.environment.nsw.gov.au/NationalParks/parkHome.aspx?id=N1106>
- <http://www.austlii.edu.au/au/legis/nsw/bill/npehrrb206578>).
- Kuskie, P. J. 1994a. An archaeological assessment of a land rezoning proposal at Lot 1 DP 559519, Thornton, NSW. An unpublished report to Gutteridge Haskins and Davey Pty Ltd.
- Kuskie, P. J. 1994b. *Further archaeological investigations of Lot 1 DP 559519, Thornton, NSW*. An unpublished report to Gutteridge Haskins and Davey Pty Ltd.

- Kuskie, P. J. and Kamminga J 2000. *Salvage of Aboriginal archaeological sites in relation to the F3 Freeway near Lenaghans Drive, Blackhill, NSW (Vol. A)*. Unpublished report to the Roads and Traffic Authority.
- Lake Macquarie City Council (LMCC) Website 2004. *Lake Macquarie Local Environmental Plan*,
<http://www.legislation.nsw.gov.au/viewtop/inforce/epi%2B116%2B2004%2BFIRST%2B0%2BN/>.
- Lambert, D 1989. *Impacts of subsidence resulting from underground mining on an aboriginal rock art site near Bulli*, unpublished report for Jo McDonald Cultural Heritage Management.
- Lang, J. D. 1815. Papers 1851- 1887..
- Lough, J C and Associates 1981. *Freeway No. 3 Wallarah Creek Interchange to Wallsend Archaeological Survey*, unpublished report to the Department of Main Roads.
- Low, T 1989. *Bush Tucker: Australia's Wild Food Harvest*. Angus and Robertson. Australia.
- Low, T 1990. *Bush Medicine: A Pharmacopoeia of Natural Remedies*. Angus and Robertson. Australia.
- Lower Wonnarua Tribal Consultancy Pty Ltd. 2003. *RTA F3 Seahampton to Branxton: Aboriginal Cultural Heritage Assessment*. Unpublished report to the Roads and Traffic Authority, Appendix 2, Umwelt 2003b.
- Mankind* 1932. Volume 1, No.4, 4 March 1932.
- Matthei, L E 1995. *Soil Landscape of the Newcastle 1:100 000 Sheet (Allworth, Stockton, Maitland, Paterson)*, Department of Land and Water Conservation, Sydney.
- Matthews, R.H. 1894 Some stone implements used by the Aborigines of New South Wales. *Journal and Proceedings of Royal Society of New South Wales* (28):301-305.
- Maynard, Lesley 1979. The Archaeology of Australian Aboriginal Art, pp. 83-110 in, S M Mead, I. Bryner and S. Martich (eds), *Exploring the visual art of Oceania; Australia, Melanesia, Micronesia, and Polynesia* - University Press of Hawaii Honolulu.
- McDonald, J. 2007. *Dreamtime Superhighway, Sydney Basin Rock Art and Prehistoric Information Exchange*. ANU epress: Canberra.
- Mindaribba Local Aboriginal Land Council. 2003. *RTA F3 to Branxton: Aboriginal Cultural Heritage Assessment*. Unpublished report to the Roads and Traffic Authority, Appendix 2, Umwelt 2003b.
- Mills, R. 1999 *An Aboriginal Heritage Study of a proposed Northlakes residential development at Cameron Park, near Newcastle NSW*. A report prepared for North Lakes Pty Ltd.
- Nanson, G C and R W Young 1983. *Aspects of Australian sandstone landscapes*, Australian and New Zealand Geomorphology Group: Sydney.
- National Native Title Tribunal (NNTT) 2008-2009. *About indigenous land use agreements*. Retrieved June 12 2009 from http://www.nntt.gov.au/Indigenous-Land-Use-Agreements/Pages/About_iluas.aspx

- Newcastle Sun 23 April 1924 Fifty Years of Progress: Memorable Days in Wallsend's History.
- NPWS 1997. *Aboriginal Cultural Heritage: Standards and Guidelines Kit*. NSW National Parks and Wildlife Service.
- Organ and Speechley 1997. Illawarra Aborigines, in Hagan, JS and Wells, A (eds), *A History of Wollongong*, University of Wollongong Press. P 7-22.
- PLantNet 1999 – 2009. Royal Botanic Gardens & Domain Trust, Sydney Australia. <http://plantnet.rbgsyd.nsw.gov.au/> Cited 23 June 2009
- Steele, N. 1993. Archaeological survey, Northlakes urban release area, Edgeworth/Wallsend, NSW. A report prepared for North Lakes Urban Release Area Landowners Committee.
- Stewart, K and Percival, B 1997. *Bush Foods of New South Wales. A Botanic Record and an Aboriginal Oral History*. Royal Botanic Gardens. Sydney.
- Strata Engineering 2006. *Mine Subsidence Impact Assessment for the Proposed Longwall Panels in the Western and Southern Domains, West Wallsend Colliery*, unpublished report to Oceanic Coal Ltd.
- Suters Architects Snell et al 1993. *City of Lake Macquarie Heritage Study*.
- Tindale, N. B. 1974. Aboriginal tribes of Australia: Their Terrain, Environmental Controls, Distribution Limits and Proper Names. Australian National University Press, Canberra.
- Turbet, P. 1989. *The Aborigines of the Sydney district before 1788*. Kangaroo Press: Kenthurst.
- Turner J. and Blyton, G. 1995. *The Aborigines of Lake Macquarie. A Brief History*. Lake Macquarie City Council.
- Twidale, C.R 1968, *Geomorphology: with special reference to Australia*, Nelson: Melbourne
- Twidale, C R and E M Campbell 1993. *Australian landforms: structure, process and time*, Gleneagles Publishing: Adelaide.
- Umwelt (Australia) Pty Limited. 1998. *Newstan Colliery Life Extension Project EIS*. A report prepared for Powercoal Newstan. November 1998.
- Umwelt (Australia) Pty Limited. 2001. Aboriginal Archaeological assessment and sub-surface investigation of the proposed Freeway Industrial Estate at South Beresfield, NSW. A report prepared for Harper Somers Pty Ltd. September 2001.
- Umwelt (Australia) Pty Limited 2002. *Archaeological Assessment of the Area to be Impacted by the Proposed Tasman Mine Surface Facilities, near Seahampton, NSW*. Unpublished report to the Newcastle Coal Company Pty Ltd.
- Umwelt (Australia) Pty Limited 2003a. *Proposed National Highway Link: F3 Freeway to Branxton. Project No. 60052, Additional Aboriginal Heritage Assessment*. Unpublished report to the Roads and Traffic Authority.

- Umwelt (Australia) Pty Limited 2003b. *Minmi Corridors Assessment – Maintaining and Enhancing Natural and Cultural Heritage Values*. Unpublished report for Newcastle City Council.
- Umwelt (Australia) Pty Limited. 2003c. Lake Macquarie Aboriginal Heritage Study, Stage 1B. A report to Lake Macquarie City Council. May 2003.
- Umwelt (Australia) Pty Limited 2004a. *Review of Environmental Factors – Northern Domain Longwall Mining, West Wallsend Colliery*. Unpublished report for Oceanic Coal Australia Ltd.
- Umwelt (Australia) Pty Limited 2004b. *Review of Archaeological Constraints and Management Recommendations for Section 1 of the Proposed National Highway Link F3 to Branxton*, Unpublished report to the Roads and Traffic Authority.
- Umwelt (Australia) Pty Limited 2004c. *Discussion Paper: Sustainable Management of the Aboriginal Cultural Heritage in the Lake Macquarie Local Government Area*. Discussion Paper prepared on behalf of the Lake Macquarie City Council.
- Umwelt (Australia) Pty Limited 2004d. *Centennial Newstan Longwalls 22 and 23 Archaeological Survey and Assessment*. Unpublished report for Centennial Newstan.
- Umwelt (Australia) Pty Limited 2005. *Further Archaeological Assessment for the West Wallsend Colliery*. Unpublished report for Oceanic Coal Australia Ltd.
- Umwelt (Australia) Pty Limited 2006a. *Aboriginal Archaeological and Cultural Heritage Assessment of the Western Domain*. Unpublished report for Oceanic Coal Australia Ltd.
- Umwelt (Australia) Pty Limited 2006b. *Hydrology, Ecology and Archaeology Assessment for the Southern Domain, West Wallsend Colliery*. Unpublished report to Oceanic Coal Australia Ltd.
- Umwelt (Australia) Pty Limited 2006c. *Aboriginal and Archaeological Survey and Assessment of the Proposed Easement to Tasman Lease, West Wallsend*. Unpublished report to Newcastle Coal.
- Umwelt (Australia) Pty Limited 2006d. *Amended Review of Environmental Factors – Northern Domain Longwall Mining, West Wallsend Colliery*. Unpublished report to Oceanic Coal Australia Ltd.
- Umwelt (Australia) Pty Limited. 2006e. Proposed National Highway Hunter Expressway F3 to Branxton Preliminary Report Stage 2 Section 90 Salvage and Section 87 Subsurface Investigation. A report prepared for the Roads and Traffic Authority. May 2006.
- Umwelt (Australia) Pty Limited 2006f. *Proposed National Highway Link F3 to Branxton - Stage 3 Research Design and Methodology to Accompany a DEC Section 90 Consent Application*. A report prepared for the Roads and Traffic Authority.
- Umwelt (Australia) Pty Limited 2007. *Research Design and Methodology to Accompany s Section 87 Preliminary Research Permit Application, Western Domain, Wakefield NSW*. Unpublished Research Design to Accompany a Section 87 Permit Application

- to the Department of Environment and Climate Change on behalf of Oceanic Coal Australia Limited.
- Umwelt (Australia) Pty Limited 2008. *Results of Geomorphic Investigations Conducted in Relation to AHIP#2789, 'Wet Soak' Western Domain, West Wallsend Colliery*. Unpublished report to the Department of Environment and Climate Change on behalf of Oceanic Coal Australia Limited.
- Umwelt (Australia) 2009a. Sustainable Management of Aboriginal Cultural Heritage in the Lake Macquarie Local Government Area: Lake Macquarie Aboriginal Heritage Management Strategy. A report prepared for the Lake Macquarie City Council.
- Umwelt (Australia) Pty Limited 2009b. Ecological Assessment - West Wallsend Colliery Continued Operations Project. A report prepared for Oceanic Coal Pty Limited. December 2009.
- Umwelt (Australia) Pty Limited 2009c. Historical Heritage Assessment - West Wallsend Colliery Continued Operations Project. A report prepared for Oceanic Coal Pty Limited. December 2009.
- Umwelt (Australia) Pty Limited. 2010. Hunter Expressway. Aboriginal Cultural Heritage Plan of Management. A report prepared for the Roads and Traffic Authority. January 2010.
- Umwelt (Australia) Pty Limited in prep. *Results of temporary surface salvage WD1, 2, 3, 4 and 9 (38-4-996-9 and 38-4-1003)*. Unpublished report to the Department of Environment and Climate Change on behalf of Oceanic Coal Australia Limited.
- UTM 2009. *Arboricultural Assessment of Scarred Trees at Xstrata Coal Operations West Wallsend*. Unpublished report prepared for Xstrata Coal NSW.
- Vinnicombe, P 1980. *Prediction and Predilection: A Study of Aboriginal Sites in the Gosford - Wyong Region*, unpublished report to the NSW National Parks and Wildlife Service.
- Wallsend and Plattsburg Sun* 13 December 1890.
- Wallsend and Plattsburg Sun* 3 January 1891.
- Watchman, A. 1990. A review of studies into the composition of pigments used in Australian rock paintings. Pp.57-64 in *50 Ans Après la Decouverte de Lascaux, Journées Internationales D'étue sur la Conservation De L'Art Rupestre*.
- Wilson, J. 1994. *The use of Aboriginal Axe Quarries in the Tamworth Region*. B.A. (Honours) Thesis, University of New England: Armidale.
- Zola, N and Gott, B 1992. *Koorie Plants Koorie People: Traditional Aboriginal Food, Fibre and Healing Plants of Victoria*. The Koorie Heritage Trust. Melbourne.



Managed by



Business Hour Contact Number

OCAL Environment and Community Coordinator: +61 2 4941 2115

24 Hour Contact Number:

West Wallsend Colliery: +61 2 4941 2100

Mailing Details:

Oceanic Coal Australia Pty Ltd
PO Box 4186
Edgeworth NSW 2285
Fax Oceanic Coal: +61 2 4955 2314



Umwelt (Australia) Pty Limited

2/20 The Boulevard
PO Box 838
Toronto NSW 2283

Ph. 02 4950 5322
Fax 02 4950 5737

www.umwelt.com.au