

ENVIRONMENTAL ASSESSMENT

Sand Extraction Operations from Lots 218 and 220, Salt Ash

Volume 2 Appendices 5-10

APRIL 2009



Volume	1		Main Text
		Appendix 1	Director-General's Requirements
		Appendix 2	EA Form and Project Team
		Appendix 3	Assessment of Available Resources
		Appendix 4	Ecological Assessment
Volume	2	Appendix 5	Aboriginal Cultural Heritage Assessment
		Appendix 6	Historic Heritage Review
		Appendix 7	Traffic Assessment Report
		Appendix 8	Noise Impact Assessment
		Appendix 9	Air Quality Impact Assessment
		Appendix 10	Greenhouse and Energy Profile

APPENDIX 5

Aboriginal Cultural Heritage Assessment

Mackas Sand

**Aboriginal Cultural Heritage
Assessment of Sand Extraction
Operations from Lot 218 DP 1044608
and Lot 220 DP 1049608, Salt Ash**

April 2009

Aboriginal Cultural Heritage Assessment of Sand Extraction Operations from Lot 218 DP 1044608 and Lot 220 DP 1049608, Salt Ash

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Mackas Sand

Project Director:	Peter Jamieson		
Project Manager:	Steven Crick		
Report No.	1646/R07/FINAL	Date:	April 2009



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

TABLE OF CONTENTS

1.0	Introduction	1.1
1.1	Location of the Proposal Area.....	1.1
1.2	Background to the Proposal	1.1
1.3	Description of the Proposal.....	1.2
1.4	Relevant Cultural Heritage Legislation.....	1.2
1.4.1	National Parks and Wildlife Act 1974 (NSW)	1.3
1.5	Objectives	1.3
1.6	Project Team.....	1.4
2.0	Aboriginal Stakeholder Consultation	2.1
3.0	Environmental Context	3.1
3.1	Landscape History	3.1
3.2	Landform Categories	3.2
3.3	Resource Availability	3.3
3.4	Past Land Use and Disturbance.....	3.4
3.5	Summary	3.5
4.0	Cultural Context.....	4.1
4.1	Ethnohistoric Information.....	4.1
4.2	Archaeological Context	4.1
4.2.1	AHIMS Registered Sites.....	4.2
4.2.2	Previous Archaeological Investigations.....	4.3
4.2.3	Summary	4.6
4.3	Predictive Model.....	4.6
5.0	Survey Methodology and Results.....	5.1
5.1	Survey Methodology	5.1
5.2	Results	5.2
5.2.1	Effective Coverage	5.6
5.2.2	Archaeological Sites	5.6
5.2.3	Potential Archaeological Deposit.....	5.7
6.0	Significance Assessment	6.1
6.1	Aboriginal Cultural Significance	6.1

6.2	Archaeological Significance.....	6.1
6.2.1	Archaeological Significance Assessment Criteria	6.2
6.2.2	Assessment of Archaeological Significance.....	6.4
7.0	Impacts in Relation to the Archaeological Assessment.....	7.1
8.0	Management and Mitigation Recommendations	8.1
8.1	General Recommendations	8.1
8.2	Lot 218 Proposal Area.....	8.2
8.3	Lot 220 Proposal Area.....	8.4
9.0	Care and Control of Archaeological Material.....	9.1
10.0	References	10.1

FIGURES

1.1	Locality Plan.....	1.1
3.1	Generalised Geomorphic Map of Stockton Bight showing location of Lot 218 and Lot 220	3.1
3.2	Landform Categories within Lot 218	3.3
3.3	Landform Categories with Lot 220	3.3
4.1	Location of AHIMS Registered Sites	4.2
5.1	Location of Surveyed Transects within Lot 218.....	5.2
5.2	Location of Surveyed Transects within Lot 220.....	5.2
5.3	Location of Recorded Sites in Lot 218 Operational Area	5.6
5.4	Location of Recorded Sites within Lot 220.....	5.6
5.5	Area of PAD within Lot 220	5.8

PLATES

1	View across Transect 1 east of the Oakvale Track facing north-east ...	5.3
2	Swale within active dune containing some remnant vegetation within Transect 1 facing north-east.....	5.3
3	View towards Mackas 1 showing stabilised dune, remainie dune, exposed soil surface and encroaching mobile dune facing south.....	5.3
4	Remains of recent campfire with oyster shell facing east	5.3
5	Active dune transgressing over stabilised dune surface facing south	5.3
6	Remains of vegetation on stable surface covered by mobile dune facing south-east	5.3
7	Transect 1 midway from centre point to southern boundary facing south	5.4
8	View along Transect 2 showing steeply inclined slopes to high dune crests facing south-west	5.4
9	View adjacent to Transect 3 showing localised low dune ridges and swales facing south-west	5.4
10	View along Transect 4 at Junction with Transect 5 facing south-west.....	5.4
11	View along Transect 5 facing north.....	5.4
12	Section of Transect 6 in which low density fragmented shell is present facing north-north-west.....	5.5
13	View along northern section of Transect 7 in area containing exposures of very low density fragmented shell facing south-west.....	5.5
14	Transect 9 showing proposed access route from electricity easement to Lot 220 facing north.....	5.5
15	Site Mackas 1 facing north-north-east	5.6
16	Nobbys tuff flake and fish bone fragment from site Mackas 1	5.6
17	Site MFMS3 containing shell material (including whole pipi) exposed by animal burrowing	5.7

ATTACHMENTS

- 1 Aboriginal Stakeholder Consultation**
- 2 Artefact Recording and Analysis**
- 3 Research Design and Methodology**

1.0 Introduction

Mackas Sand proposes to extract industrial grade sand resources at Lot 218 and Lot 220 Salt Ash on Stockton Bight, NSW on behalf of the Worimi Local Aboriginal Land Council (Worimi LALC). Umwelt (Australia) Pty Limited (Umwelt) has been engaged by Mackas Sand to undertake the necessary environmental assessments associated with the proposed sand extraction (hereafter referred to as the proposal). The proposal is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and as part of this process, the Director-General of the Department of Planning (DoP) requires that the Environmental Assessment consider the impacts of the proposal on Aboriginal cultural heritage. This assessment is being undertaken in accordance with the Director-General's requirements.

1.1 Location of the Proposal Area

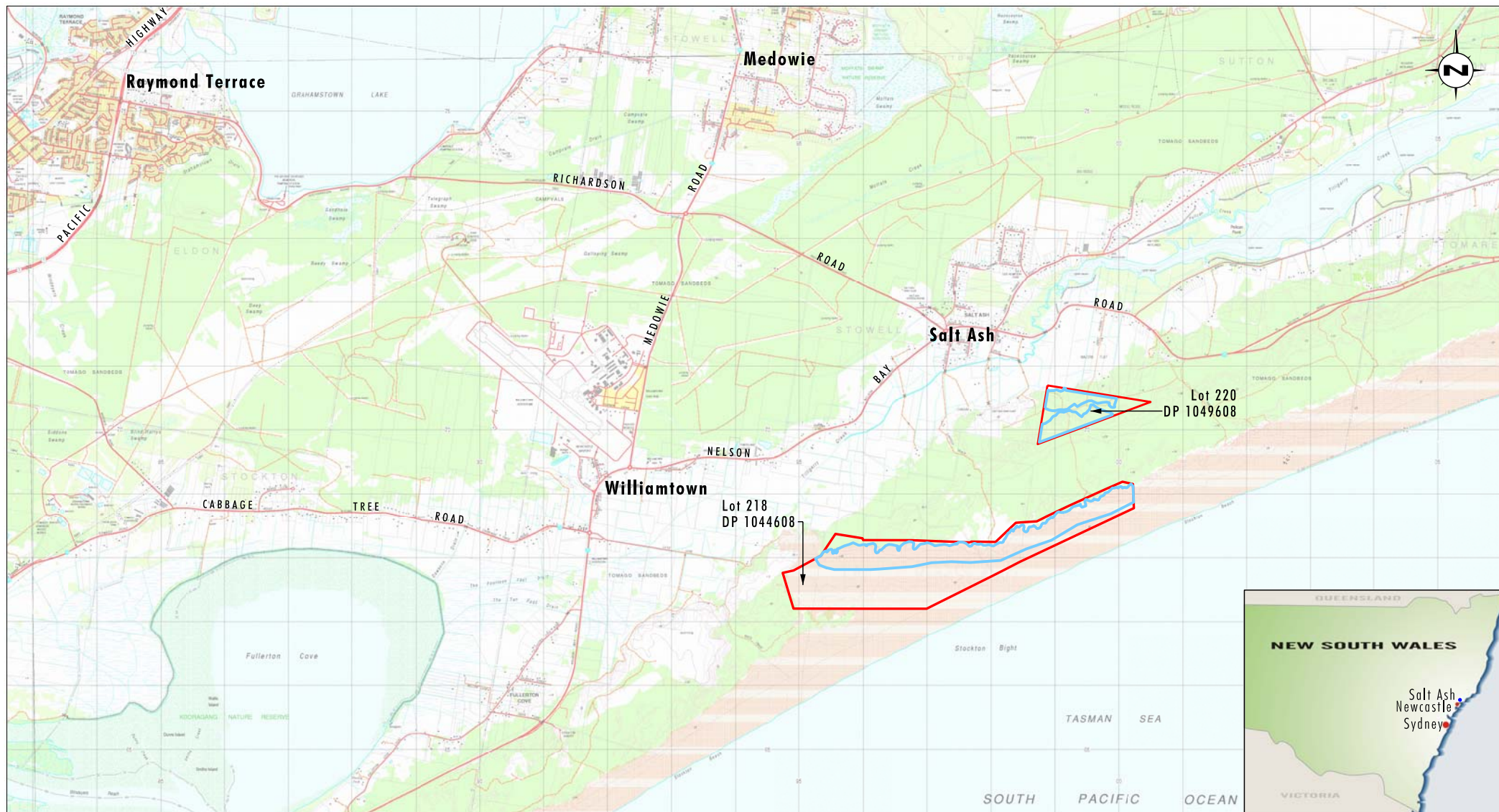
The proposal will be undertaken at two locations (Lot 218 in DP 1044608, with adjoining access across Lot 227 in DP 1097995 and Lot 220 in DP 1049608, with access across Lot 3 in DP 739188 and Lot 8 in DP 833768) that are located within the Stockton Bight dune system approximately 20 to 25 kilometres to the north-east of Newcastle, near Salt Ash (refer to **Figure 1.1**). Lot 218 is comprised of approximately 412 hectares of mobile sand dune, of which the proposal will only impact approximately 150 hectares. A small unsealed road of approximately 50 metres in length will be constructed within mobile sands in Lot 227 to provide access to Lot 218. This assessment only applies to those parts of Lot 218 and Lot 227 proposed for impact. Lot 218 is adjoined by the Worimi Conservation Lands to the north, south and east and the Quality Sands and Ceramics sand quarry to the north-west.

Lot 220 has an area of approximately 76 hectares and adjoins an existing sand extraction operation immediately to the west, operated by Unimin (formerly ACI). An existing Mackas Sand operation is also located approximately 750 metres to the west. Rural land holdings and a sand quarry operated by Hunter Quarries adjoin the site to the north and include Lot 3 and Lot 8, which will contain an unsealed road to provide access to Lot 220. Vegetated sand dunes that form part of the Worimi Conservation Lands adjoin Lot 220 to the east and south.

1.2 Background to the Proposal

Lot 218 and Lot 220 were transferred to the Worimi LALC under Section 36 of the *Aboriginal Land Rights Act 1983*. Under Section 40 of the same act, the Worimi LALC could not deal with the land vested in it if it was subject to Native Title rights unless the land was the subject of an approved determination under the *Native Title Act 1993*. Peter Hillig (on behalf of the Worimi LALC) therefore lodged a non-claimant Native Title application over these areas seeking a determination that Native Title does not exist. Full approved determinations that Native Title does not exist over Lot 218 and Lot 220 were issued on 29 November 2005 and 28 November 2005 respectively.

The Worimi LALC also lodged a series of land claims over a larger portion of Stockton Bight under the *Aboriginal Land Rights Act 1983*. These land claims included an area over which the New South Wales government had identified its intention to create a National Park. In 2001, the New South Wales government, the Worimi LALC and the Worimi Traditional Aboriginal Elders and Owners Group agreed to resolve these land claims through a co-management agreement under Part 4A of the *National Parks and Wildlife Act 1974* (the NPW Act). In February 2007 the co-management agreement culminated in Crown Lands in the Stockton Bight area being granted to the Worimi LALC to be leased back to the State



Source: Department of Lands, 2006

0 1 2 4 km
1:85 000

Legend

- ▬ Lot Boundaries
- ▬ Proposed Operational Areas

FIGURE 1.1
Locality Plan

Government as three conservation reserves collectively referred to as the Worimi Conservation Lands. These lands total 4438 hectares that are divided into the Worimi State Conservation Area, Worimi National Park and Worimi Regional Park.

As part of the negotiations that resulted in the creation of the Worimi Conservation Lands, it was recognised that Lot 218 and Lot 220 contained substantial sand resources. The capacity for development of sand and mineral resources in portions of Stockton Bight was a State government precondition of these negotiations and it was acknowledged that the Worimi LALC anticipated that future exploitation of sand resources from lands excluded from the Conservation Lands Agreement would provide them with a long-term financial income.

1.3 Description of the Proposal

The proposed operations at each of the proposal areas will be relatively simple and will involve the preparation of the site, extraction of sand with front-end loaders, transport operations and site rehabilitation as required. Extracted sand may be processed on-site, with the majority of sand to be passed through either coarse screens or processed in a wash plant that will be located at Lot 220 if a suitable source of water is obtained before being taken off-site.

Development of Lot 218 will involve the construction of an unsealed access road approximately 50 metres long through windblown sand on Lot 227 in DP 1097995 and establishment of a strip up to 150 metres wide along the landward margin of the transgressive dune. Front-end loaders will continuously work the strip, allowing for mobile, wind-blown sand to replenish in areas where they are not working. Wind-blown sand will continue to blow into previously worked areas during the life of the operation, potentially giving the operation an indefinite life span at Lot 218.

Development of Lot 220 will involve the construction of an unsealed access road on Lot 8 in DP 833768, Lot 3 in DP 739188, extending from an existing electricity easement to the north-western boundary of Lot 220, the staged removal of vegetation and topsoil by bulldozer, followed by extraction and loading with front-end loaders. It is intended to commence extraction in the north-western portion of Lot 220 where the access track adjoins Lot 220, with clearance and extraction to proceed in discrete sections of Lot 220 across the lifetime of the operation. Following extraction, each location will be progressively rehabilitated by the replacement of topsoil and vegetative debris and the subsequent planting of local endemic plant species. An area of approximately 28.6 hectares will be left undisturbed at this site in the central low-lying area and in buffer areas around the site boundaries however it will be necessary to construct two access tracks within this area to connect the proposed extraction areas.

It is anticipated that between one million and two million tonnes of sand will be extracted from the combined operations each year.

1.4 Relevant Cultural Heritage Legislation

The NPW Act is the primary statutory control protecting Aboriginal heritage within New South Wales. In addition, the EP&A Act is a broader piece of legislation that regulates development activity within New South Wales.

The proposal satisfies the definition of a major project under State Environmental Planning Policy (Major Projects) 2005 and therefore is subject to approval under Part 3A of the EP&A Act. The application of Part 3A effectively 'turns off' the approval requirements of the NPW

Act and local planning instruments established under the EP&A Act. The Minister for Planning is the determining authority for any project assessed under Part 3A of the EP&A Act. As part of this process, it is anticipated that the Director-General of DoP will require that the Environmental Assessment considers the impacts of the proposal on Aboriginal cultural heritage.

Approval conditions relating to cultural heritage may then be issued by DoP in consultation with the Department of Environment and Climate Change (DECC). As such, the proposal will still be influenced by the NPW Act.

1.4.1 National Parks and Wildlife Act 1974 (NSW)

The DECC is primarily responsible for regulating the management of Aboriginal cultural heritage in New South Wales under the NPW Act. The objectives of the NPW Act include:

The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: (i) places, objects and features of significance to Aboriginal people.

Part 6 of the NPW Act provides protection for Aboriginal objects and Aboriginal places, which are defined as follows in the DECC *Interim Community Consultation Requirements for Applicants* (2004: 2-3).

An **Aboriginal object** is 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 occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains (as defined within the meaning of the NPW Act).

An **Aboriginal place** is a place which has been declared so by the Minister administering the NPW Act because he or she believes that the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects. Aboriginal places are gazetted in accordance with Section 84 of the NPW Act.

Under Section 86 of the NPW Act, it is an offence to disturb or excavate land for the purpose of discovering an Aboriginal object (unless permitted to do so in accordance with Section 87) and it is also an offence under Section 90 of the NPW Act to destroy, deface, damage or permit the destruction, defacement of or damage to an Aboriginal object or Aboriginal place without first obtaining the consent of the Director-General of DECC.

1.5 Objectives

The key objective of the assessment was to assess the archaeological and Aboriginal cultural heritage significance of the proposal area and to provide appropriate mitigation and management strategies in relation to the proposed activities. In order to achieve this objective, the assessment involved:

- undertaking detailed consultation with relevant Aboriginal stakeholders in accordance with the DECC *Interim Community Consultation Requirements for Applicants* (**Section 2**);
- reviewing the environmental and archaeological context of the Stockton Bight region and the proposal areas specifically (refer to **Sections 3** and **4**) in order to develop a model with which to predict the likelihood that archaeological material (namely Aboriginal objects) will be present in the proposal areas and to provide background information against which to assess the significance of any sites or areas of potential archaeological deposit (PAD) that may be present in the proposal areas;

- undertaking a survey of the proposal areas in consultation with the relevant Aboriginal stakeholders (**Section 5**);
- assessing the cultural heritage significance of the proposal areas primarily based upon the scientific and Aboriginal cultural heritage significance of any archaeological sites or areas of potential archaeological deposit they may contain in addition to considering the broader cultural landscape that comprises the proposal areas (**Section 6**);
- reviewing the impacts of the proposal in relation to the archaeological assessment (**Section 7**); and
- providing appropriate recommendations to manage and mitigate impacts to cultural heritage within the proposal areas (**Section 8**).

1.6 Project Team

This assessment report was prepared by Nicola Roche and reviewed by Jan Wilson and Peter Jamieson. The survey of the proposal area was conducted by Nicola Roche, Leanne Anderson, Anthony Anderson and Jamie Merrick.

2.0 Aboriginal Stakeholder Consultation

DECC advocates the use of the *Interim Community Consultation Requirements for Applicants* (2004) (the requirements) when assessing Aboriginal cultural heritage in relation to proposals being considered under Part 3A of the EP&A Act. For the purposes of this assessment, all consultation was undertaken in accordance with the requirements and is summarised in Table 1 of **Attachment 1**.

The notification process involved the placement of a public advertisement in the Newcastle Herald on 5 May 2008 (refer to **Attachment 1**). Letters providing notice of the proposed assessment and requesting information on known Aboriginal stakeholders that may wish to be consulted regarding the assessment were sent to DECC, New South Wales Native Title Services, the Office of the Registrar of Aboriginal Owners, Worimi LALC and Port Stephens Council on 11 June 2008 (refer to **Attachment 1**). In addition, letters seeking registrations of interest for consultation regarding the assessment and providing a proposed methodology for the survey were sent on 11 June 2008 to the following Aboriginal stakeholder groups known to have an interest in the Stockton Bight area:

- Worimi Local Aboriginal Land Council;
- Nur-Run-Gee Pty Ltd (Nur-Run-Gee);
- Worimi Traditional Aboriginal Elders and Owners Group;
- Mur-Roo-Ma Incorporated (Mur-Roo-Ma); and
- Maaiangal Aboriginal Heritage Co-operative.

Each of these groups registered an interest in being consulted regarding the assessment, with Worimi Traditional Aboriginal Elders and Owners Group and Maaiangal Aboriginal Heritage Co-operative indicating that they would not be participating in the survey of the proposal areas. Aboriginal stakeholders participating in the survey of the proposal areas conducted on 14 July and 18 July 2008 were Jamie Merrick (Worimi LALC), Leanne Anderson (Nur-Run-Gee Pty Ltd) and Anthony Anderson (Mur-Roo-Ma Incorporated). During the survey period, Aboriginal stakeholder representatives were asked whether they had any additional cultural information to provide about the proposal areas. Both Jamie Merrick and Anthony Anderson indicated that they had participated in previous archaeological surveys of Lot 220 and a section of Lot 218 and were aware of the presence of previously recorded archaeological sites in Lot 220. These sites were inspected as part of the survey (refer to **Section 5**).

A copy of the draft of this assessment was provided to the relevant Aboriginal stakeholders on 15 August 2008. It was requested that the Aboriginal stakeholders provide any additional information relevant to the assessment of the proposal areas and identify whether this information is suitable to be placed in the public domain. Furthermore, it was requested that Aboriginal stakeholders provide comment on the cultural heritage significance of the proposal areas and the proposed recommendations for the mitigation and management of impacts to cultural heritage within these areas. Comments were received from all relevant stakeholders, with written comments included in full in **Attachment 1**.

In correspondence dated 19 August 2008 Leanne Anderson (on behalf of Nur-Run-Gee) stated that Nur-Run-Gee accept the proposed management recommendations and the proposed arrangement for care of any salvaged artefacts. Leanne also notes that Nur-Run-Gee are looking forward to participating in the development of an Aboriginal Cultural Heritage Management Plan (ACHMP) for the proposal areas (refer to **Section 8.1**).

In an email dated 20 August 2008, Anthony Anderson (on behalf of Mur-Roo-Ma) stated that Mur-Roo-Ma understands and agrees with the recommendations provided in the draft report and strongly supports the establishment of a management system and the completion of archaeological investigations. Anthony also indicated that the proposal areas are significant to Aboriginal people as part of the Stockton Bight landscape.

In correspondence dated 29 August 2008 Andrew Smith and Jamie Merrick (on behalf of Worimi LALC) stated that Worimi LALC supports the general recommendations provided in Section 8.1 and requested some minor changes to the wording of recommendations in Section 8.2 and Section 8.3 to clarify that sample material collected during operations may be kept on site within the Mackas operations to be inspected in tandem with the monthly Management Group inspection of the Lot 218 operations. This has been clarified in **Sections 8.2 and 8.3**. Support was also provided for the development of an ACHMP. Worimi LALC would like to see clear acknowledgement with the ACHMP that the management group is an advisory body that has specific roles and responsibilities relating to the implementation and is distinct to the proponent, who is responsible for day to day operations of the proposed operations. It is also requested that the proponent be involved in the development of the ACHMP. These matters will all be addressed as part of the development of the ACHMP.

In a telephone conversation on 15 September 2008, Carol Ridgeway-Bissett (on behalf of Maaiangal Aboriginal Heritage Co-operative) indicated that she fundamentally disagrees with sand extraction in general and considers it a destructive process. However, she recognises that sand extraction may proceed in the proposal areas despite her objection. Should this be the case, Carol emphasised the importance of protecting Aboriginal cultural heritage during the sand extraction process.

In a telephone conversation on 24 September 2008, Les Ridgeway (on behalf of Worimi Traditional Aboriginal Elders and Owners Group) stated that he had received the report and is happy with its content. His only concern was that if cultural material is exposed on site, it is dealt with appropriately. It was discussed that management mechanisms have been developed to deal with this eventuality and will be further addressed as part of the ACHMP. Les was satisfied with this response.

Following the receipt of comment on the draft report, the proposal was modified slightly to involve the construction of an unsealed access road to Lot 218 across a small section of Lot 227. The draft report was altered to reflect this modification and correspondence was provided to the relevant stakeholders on 28 November 2008 regarding the matter. In this correspondence (provided in **Attachment 1**), it was requested that the stakeholders comment on the modifications and associated management recommendations.

3.0 Environmental Context

The decisions that people make regarding such things as where they live, the range of resources that they use and other aspects of daily life may all be influenced by the environment in which they live. The likelihood that sites will be preserved and visible is also affected by environmental factors such as vegetation and past land use and disturbance. A review of the environmental context of the proposal areas is therefore an essential component of developing a model with which to predict the likelihood that Aboriginal archaeological sites will be present and preserved within the proposal areas. In reviewing the environmental context of the Stockton Bight area it is very important to recognise that significant environmental change may have occurred both during and after Aboriginal occupation of the area, particularly in relation to landscape history.

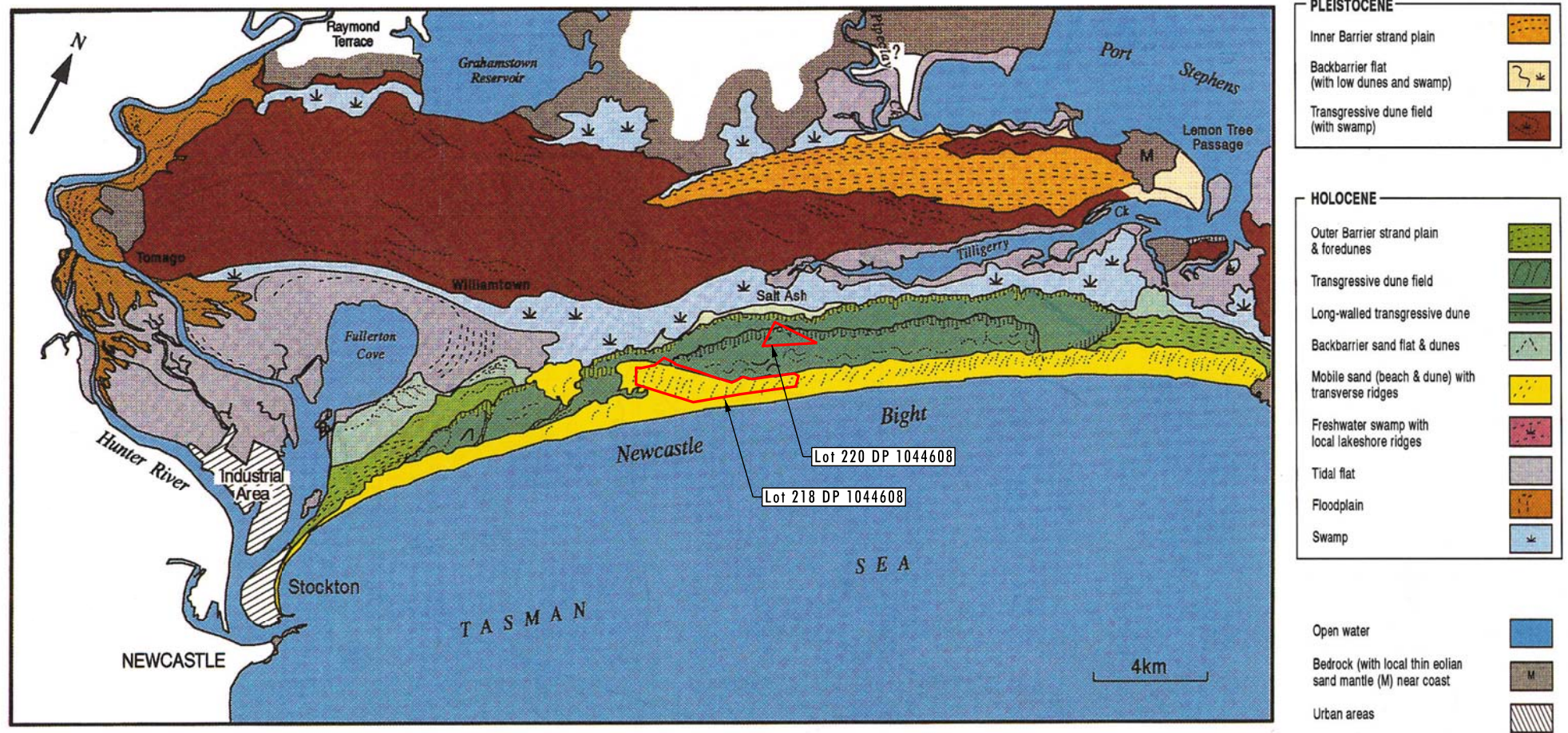
3.1 Landscape History

The proposal areas are located within a large dual barrier formation known as Stockton Bight. Considerable research has been conducted regarding the process of formation of Stockton Bight and this has been presented and summarised by several authors (refer to Dean-Jones 1990: Chapter 2; Thom et al 1992; Umwelt 2000:4.2-4.4; ERM 2006:5-9).

Stockton Bight consists of an inner barrier of Pleistocene age (referred to as the Inner Barrier), a seaward barrier of Holocene age (referred to as the Outer Barrier) and a low-lying swampy depression that divides the barriers and is known as the Inter-Barrier depression (refer to **Figure 3.1**). Prior to approximately 120,000 years ago, the Hunter River flowed to the north-east of its present route, passing through what is now Fullerton Cove. During the last Interglacial period (approximately 120,000 years ago), sea levels increased, passing current levels and depositing sediments to form a strand plain that constitutes the initial stage of Inner Barrier formation. These sediments blocked watercourses fed from the surrounding valleys, resulting in the formation of fresh water swamps such as Grahamstown Swamp and also causing the Hunter River to assume its current course.

During the Last Glacial period (approximately 116,000 to 10,000 years ago), climatic conditions changed again and sea levels fell such that the shoreline was approximately 30 kilometres seaward of the current shoreline. The beach sands that had been deposited as the Inner Barrier strand plain were subsequently exposed to aeolian reworking across much of Stockton Bight, resulting in the formation of wind-blown sand dunes across the majority of the Inner Barrier. As the climate became warmer and wetter from approximately 10,000 – 6500 years ago sea levels gradually rose again and deposited former beach sands as backbarriers and enclosed tidal deltas to form estuarine lagoons. Approximately 7900 – 7400 years ago sea level rose to approximately 1-1.5 metres above its current level. Sea level remained at this elevation until approximately 2000 years ago, after which time it gradually retreated until reaching its current level (Sloss et al 2007). Between approximately 6000 and 4500 years ago the Outer Barrier began to develop due to the deposition of wind-blown sand along the coastline and inland. This created a series of beach ridges and strand plains that further impeded drainage from low-lying areas and increased siltation of lagoons to form the Inter Barrier depression.

Additional phases in the formation and subsequent evolution of the Outer Barrier appear to have varied between the southern and central sections (extending from Stockton to Bob's Farm) and the north-eastern section of Stockton Bight. As the proposal areas are located in the central section of Stockton Bight, this area will be focus of this discussion. Within the southern and central portions of Stockton Bight the subsequent development of the Outer Barrier can be divided into two periods of relative stability interspersed by two major periods of sand movement (generally referred to as dune transgression). Based on dates



Source: Thom et al (1992)

Legend

Approximate Location of Lot Boundaries

0 2.5 5 10 km
1:210 000

FIGURE 3.1

Generalised Geomorphic Map of Stockton Bight showing Location of Lot 218 and Lot 220

extrapolated from the Myall Lakes region, the initial phase of dune transgression occurred between 3000 and 1200 years ago, with a subsequent phase taking place from 500 years ago to the present (Umwelt 2000:4.4). These dates should be considered relative rather than absolute. However, the results of recent research (refer to Sloss et al. 2007) indicates that sea level highstand was maintained until approximately 2000 years ago before receding to current levels, which partially correlates with the proposed date for the first period of dune instability.

During the periods of stability, sand deposits were consolidated to form dune fields that originally extended across the then deflation basin to the landward edge of the Outer Barrier. At this time, it is likely that the dunes were vegetated by coastal woodland with occasional wetland communities occurring within dune swales (Umwelt 2000:4.10). However during subsequent phases of dune transgression the majority of these stabilised surfaces were (and continue to be) variably buried, exposed, partially or completely eroded and/or reburied. The Outer Barrier can therefore be divided into three dune fields (Ridge I, Ridge II and Ridge III), two of which are associated with formerly stabilised soil surfaces that extend variably towards the current beach front and the third of which represents the active phase of dune transgression (Umwelt 2000:4.4-4.6).

Ridge I dunes are located furthest from the current sea-front and this dune field is associated with the greatest degree of soil development. Former stabilised surfaces associated with Ridge I dunes are considered to have formed between 4500-3000 years ago. Ridge II dunes formed between approximately 1200 and 500 years ago and in some areas these dunes have transgressed over Ridge I dunes. Soils associated with Ridge II stabilised surfaces are similar to those associated with Ridge I but have a less developed sub-soil (B horizon). Ridge III dunes are those that are actively transgressing across the area and, in some areas, overriding Ridge II dunes.

In reviewing the process of formation of the Outer Barrier, Umwelt undertook a series of auger transects within the Mineral Deposits Limited (MDL) lease to the south-west of the proposal areas (refer to Umwelt 2000:Appendix C). Three soil profiles of varying degrees of development were identified, with Umwelt (2000:Appendix C:4) suggesting that these represent two and possibly three phases of soil stabilisation on Stockton Bight. Interestingly, current models of Outer Barrier formation do not identify a third period of stabilisation. It should also be noted that these soils are not continuous across the area but have been subject to differential erosion from extensive dune movement (Umwelt 2000:Appendix C:4).

The Lot 218 proposal area consists of Ridge III dunes transgressing over at least one stabilised surface. Within the central portion of the proposal area, the Ridge III dunes are transgressing over Ridge II dunes whilst in the north-western corner the active dune intersects with two separate lines of dunes, presumably Ridge II but possibly also Ridge I dunes.

The Lot 220 proposal area includes Ridge II dunes along its southern border, which are separated from Ridge I dunes by a narrow area of relatively low-lying ground. The Ridge I dunes abut the Inter-Barrier depression to the north, with the proposed access track located on the Inter-Barrier depression.

3.2 Landform Categories

For the purposes of this assessment, the proposal areas have been divided into landform categories based on slope and geomorphic classification. The criteria specified by Speight (1990) were utilised in defining slope classes and are listed in **Table 3.1**.

Table 3.1 - Slope Class Definitions

Slope Class	Approximate Slope (°)
Level	<0°35'
Very gently inclined	0°35' - <1°45'
Gently inclined	1°45' - <5°45'
Moderately inclined	5°45' - <18°
Steep	18° - 30°

As shown in **Figure 3.2**, the Lot 218 proposal area is comprised predominantly of gently to moderately inclined slopes leading to very gently inclined slopes and level crests. However, as discussed above, whilst the active transgressive dune in this area has been relatively recently deposited, this does not negate the possibility that soil profiles associated with the Ridge II dune field (and possibly the Ridge I dune field) may be present below the recently deposited sands. By extrapolating from the topography of the adjoining areas, it is likely that the former stabilised surface within the Lot 218 proposal area consisted of gently inclined slopes on the seaward face (bordering a deflation basin) that led to a narrow dune crest before descending moderately to gently and very gently inclined slopes on the landward face.

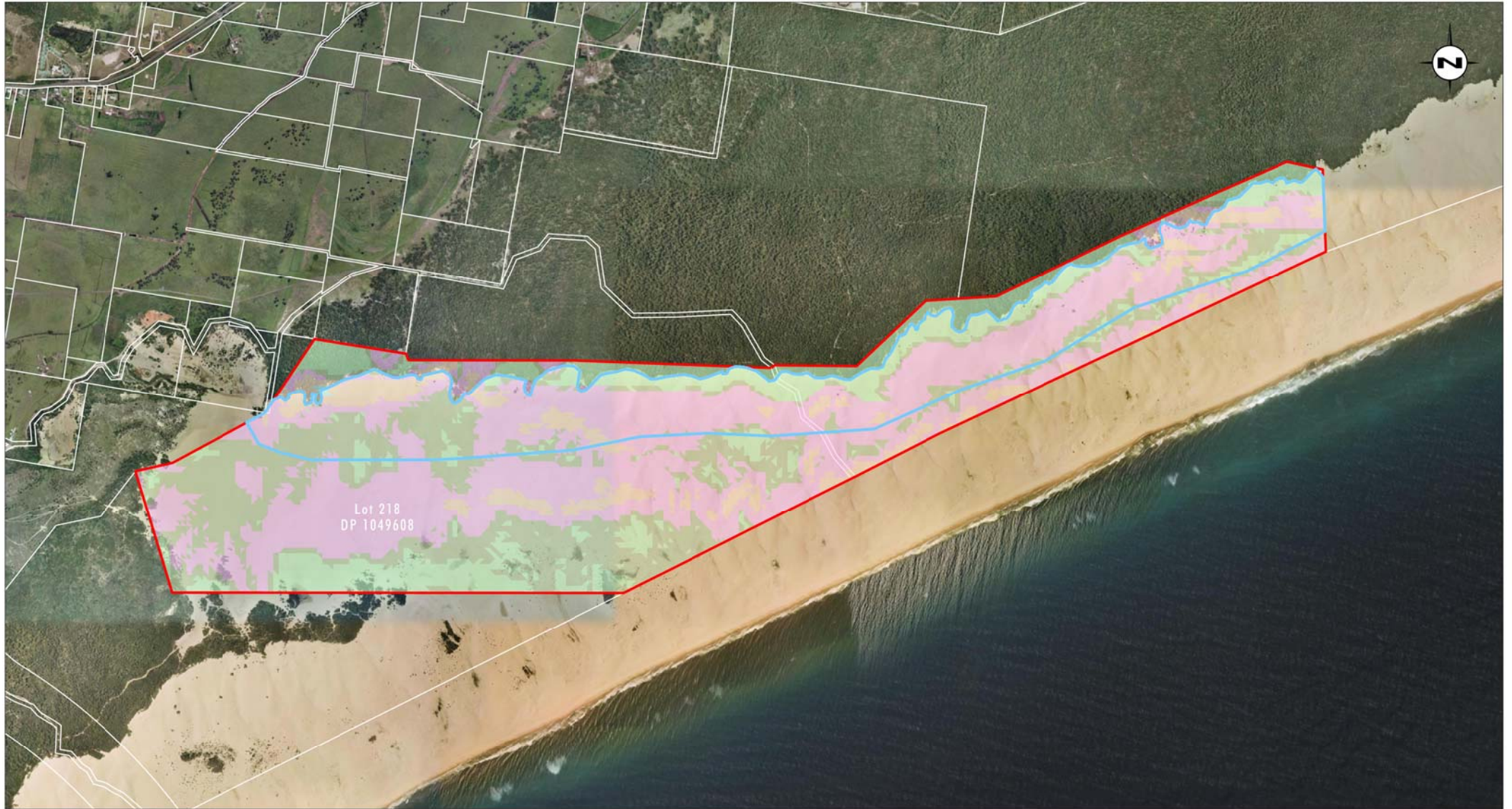
The Lot 220 proposal area consists of a band of level ground through the centre of the proposal area bordered by very gently inclined slopes, with moderately inclined slopes leading to gently inclined crests to the north and a wider band of moderately inclined to steep slopes leading to high gently inclined crests to the south (refer to **Figure 3.3**). It should be noted that this slope analysis is based on 10 metre contour data distributed over a 25 metre grid and therefore does not reflect all minor variations within landforms. This is particularly relevant in relation to the central band of level area within Lot 220 where the contour data is not sufficiently detailed to identify the system of low relief dunes and associated swales present within this area.

3.3 Resource Availability

In assessing resource availability within the proposal areas, it is essential to consider these environments as they would have been prior to non-Aboriginal settlement. This is particularly pertinent in relation to the Lot 218 proposal area where the active transgressive dune is representative of the recent period only. As discussed above, prior to recent transgressive dune activity, the Lot 218 proposal area included stabilised Ridge II dunes (and possibly Ridge I dunes) and adjoined the Ridge II dune field. It is therefore assumed that the resources within the Lot 218 proposal area would have been the same as those currently available within the Ridge II dune field.

The availability of fresh water is a key resource consideration. There are no creeks or watercourses within the proposal areas however, within Stockton Bight the water table is relatively close to the ground surface. Ground water frequently collects in swales and is accessible through the excavation of shallow wells. The swales within the Lot 220 proposal area and within the dune field immediately adjoining the Lot 218 proposal area are likely to have contained fresh water and plant species such as bracken fern (*Pteridium esculentum*) and would have attracted a variety of associated resources including water birds and small mammals.

A comprehensive description of the flora and fauna present within the proposal areas is provided by Umwelt (2008). The Lot 220 proposal area and the area immediately adjoining



Source: Aerial: Google Earth, 2008

0 0,5 1 1,25 km
1:25 000

Legend

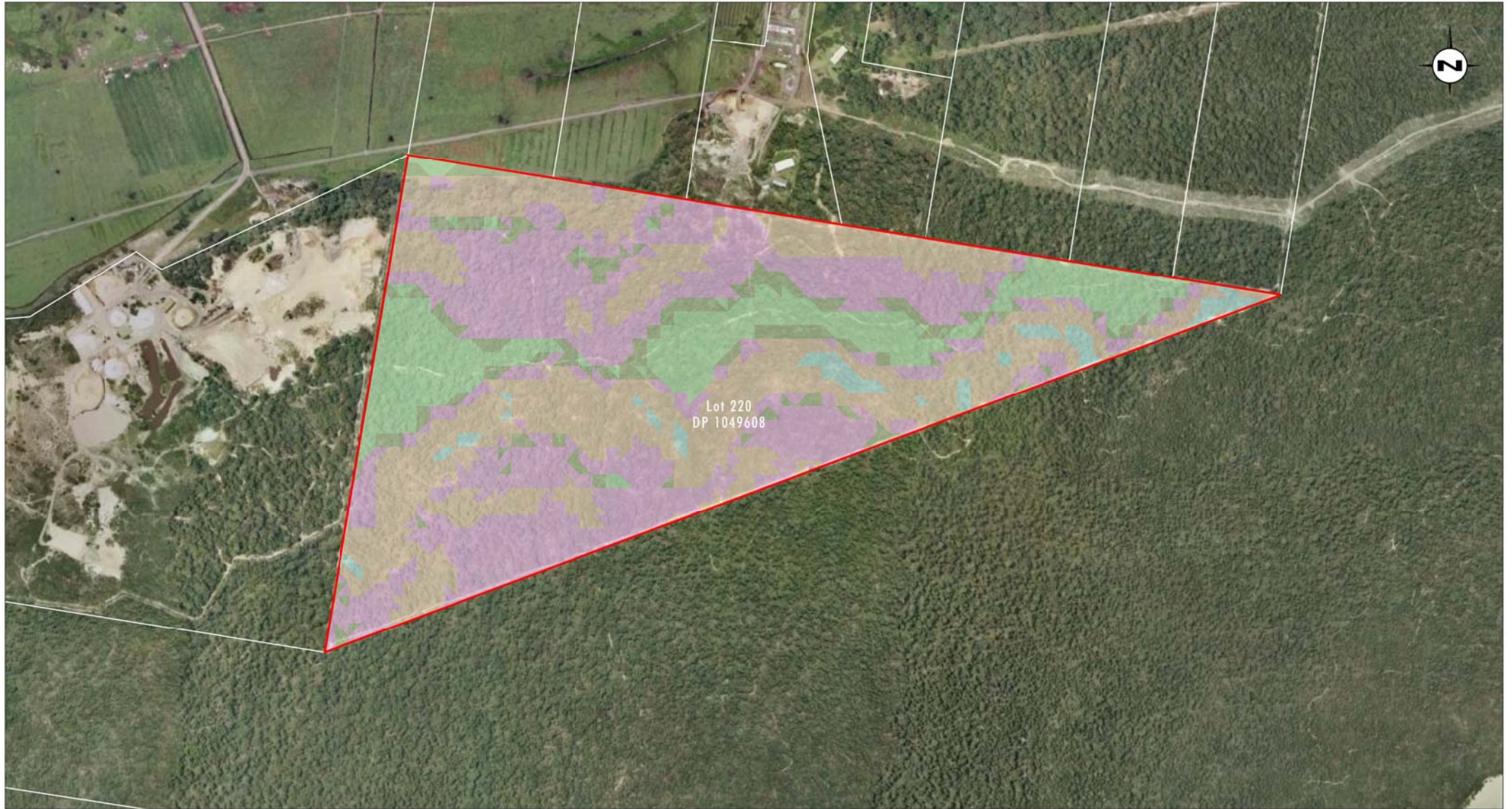
- Lot 218 Boundary
- Proposed Lot 218 Operational Area

Slope Analysis

- Level
- Very gentle incline
- Gentle incline
- Moderately inclined
- Steep

FIGURE 3.2

Landform Categories
within Lot 218



Source: Aerial: Google Earth 2008

0 100 250 500m
1:10 000

Legend

Lot 220 Boundary

Slope Analysis

Level
Very gentle incline
Gentle incline
Moderately inclined
Steep

FIGURE 3.3

Landform Categories
within Lot 220

the Lot 218 proposal area are vegetated primarily by Coastal Sand Apple – Blackbutt Forest. This vegetation community contains a number of species recorded as having been used by Aboriginal people for various purposes including food, medicine and raw materials for the construction of storage vessels, weapons and tools (refer to ERM 2006:11-12). These include native cherry (*Exocarpus cupressiformis*), bracken fern (*Pteridium esculentum*), acacias, mat rush (*Lomandra longifolia*), smooth-barked apple (*Angophora costata*), blackbutt (*Eucalyptus pilularis*), banksias (*Banksia serrata*), broad-leaf geebung (*Persoonia levis*), burrawang (*Macrozamia communis*) and sarsaparilla vine (*Smilax glychiphylla*). Vegetation of this type would also have supported a range of mammal, reptile and bird species that provided food and other resources used by Aboriginal people.

Furthermore, parts of the Lot 218 proposal area are situated within one kilometre of the current beach front and the associated marine resources including beach shellfish species such as pipi. Similarly, the Lot 220 proposal area is located on the edge of the Inter-Barrier depression in proximity to Tiligerry Creek. In this area, it is likely that the Inter-Barrier depression would have been estuarine in nature but this may have varied due to localised changes in swamp morphology and tidal patterns. Both freshwater and estuarine swamps provide a very rich range of flora and fauna that would have provided a suitable source of food, medicine and other resources used by Aboriginal people.

In contrast, the proposal areas do not contain any outcropping geological material. High quality stone frequently used for the manufacture of stone artefacts is present in the form of outcropping tuff at Nobbys Head (approximately 15 kilometres to the south-east). Lesser quality outcropping tuff from the Tomago Coal Measures is also present in the Tomago area (approximately 17 kilometres to the west) however it is not clear whether this material was outcropping prior to non-Aboriginal settlement (Dean-Jones 1990:116). A tuff quarry site at Shortland (approximately 25 kilometres to the south-west) and a source of quartzite on the eastern margin of Grahamstown Dam (approximately 11 kilometres to the north-west) have also been recorded (Dean-Jones 1990:116). Furthermore, stone from the Nerong Volcanics group outcrops in the area surrounding Port Stephens (to the north-east of the project area) and whilst the stone types present in this group are generally not highly suitable for the manufacture of stone artefacts, there have been reports of stone material from the Nerong Volcanics being utilised and found in archaeological sites (refer to ERM 2006:5).

3.4 Past Land Use and Disturbance

The consideration of past land use and disturbance factors is essential to assessing the likely presence, integrity and visibility of archaeological material. Within the Lot 218 proposal area, the primary disturbance factor is on-going dune transgression. The process of dune transgression generally involves winds blowing from the current beachfront, moving sand in a landward direction. As this happens it initially buries former stabilised surfaces however as transgression continues these new sand deposits and the stabilised surfaces underlying them are also eventually exposed to aeolian erosion, which results in the deflation of former stabilised surfaces. Thus, any archaeological material that may have been associated with a former stabilised surface loses its contextual association and is mixed with recent sand deposits and other deflated stabilised surface materials. By this mechanism, archaeological materials can undergo a sequence of burial, exposure, deflation and reburial, with detection only possible during exposure or deflation. If the archaeological material represents a deflated deposit, the loss of association between archaeological material and its original depositional context significantly impacts upon the integrity of those deposits (Umwelt 2000:2).

Within the Lot 218 proposal area the process of dune transgression has primarily resulted in sand deposition over Ridge I (and possibly Ridge II dunes) with the actively deflating transgressive face located considerably sea-ward of the proposal area. However, there are

some minor blowouts that have developed in the elevated area at the far west of the Lot 218 proposal area. The Lot 218 proposal area is also used by recreational vehicles which have the potential to impact upon any exposed archaeological materials, particularly fragile shell fragments.

In contrast, the level of disturbance within Lot 220 is relatively minor and confined to the development of a small number of narrow access tracks, including that associated with a series of large concrete tetrahedons that formed part of coastal defences during World War II designed to preventing access to the area by tanks. The location and extent of these tracks is discussed in greater detail in relation to the survey results however it is noted that the tracks represent a very small portion of the Lot 220 proposal area. The general lack of ground surface disturbance (including exposure) and the heavy vegetation coverage across much of this proposal area therefore greatly reduces the chances that any archaeological deposits that may be present will be detectable. This is also applicable to the majority of the Lot 218 proposal area where windblown sands have been recently deposited across much of the area.

3.5 Summary

The proposal areas both contain dune fields (including elevated dunes and low relief dune and swale systems) associated with periods of stability in the formation of the Outer Barrier. The Lot 220 proposal area contains elevated dune ridges from both the Ridge I and Ridge II phases of dune formation, with these high comparatively steeply sloping dune ridges separated by a system of low relief dunes and swales. Within the Lot 218 proposal area these former stable surfaces are presumably buried beneath wind-blown sands but, based on current topographic data are assumed to have been similar in nature to those of the Lot 220 proposal area. When both of the proposal areas are considered in terms of the resources that were likely to have been available prior to non-Aboriginal settlement, it is evident that both areas were very well resourced. The Lot 220 proposal area remains relatively undisturbed whilst the Lot 218 proposal area has been subject to natural processes that primarily result in the burial of former stabilised soil surfaces and the vegetation that once existed on these surfaces. The likelihood that archaeological material will be detectable within either of the proposal areas is therefore significantly diminished.

4.0 Cultural Context

In order to identify the key Aboriginal cultural heritage values of the project area it is necessary to consider not only the presence or absence of Aboriginal archaeological sites during the surface survey but also the potential that the project area may contain both archaeological sites and areas of cultural heritage value to Aboriginal people that may not be able to be identified during the course of a survey. This requires detailed consultation with Aboriginal stakeholders and the development of a predictive model for site location based on a consideration of cultural contextual information in combination with the environmental contextual information outlined in **Section 3**. The relevant cultural contextual information and a detailed archaeological predictive model are provided below.

4.1 Ethnohistoric Information

Ethnohistoric accounts provide valuable information regarding Aboriginal people during the period of early non-Aboriginal settlement. However, the reliability and accuracy of ethnohistoric records is affected by a number of factors. The majority of early historical records were written by non-Aboriginal men who would not have had access to 'closed' aspects of Aboriginal society. Aboriginal culture was largely foreign to early European settlers and was typically (and incorrectly) viewed as being 'primitive', with historical accounts often intentionally or unintentionally reinforcing this stereotype. By the time the Port Stephens, Newcastle and Lower Hunter areas were settled by Europeans, introduced diseases had already had an impact on the Aboriginal population (refer to Butlin 1982). Subsequent European settlement also resulted in significant population movement and massive social disruption and dislocation. Early ethnohistoric records generally do not distinguish between different Aboriginal tribal or clan groups and it is not possible to determine whether behaviours or practices that they describe are specific to a tribe, clan or perhaps even family or individual.

The above limitations of ethnohistoric accounts are apparent in the significant disparities in descriptions of boundaries of the Worimi area (refer to ERM 2006:20). However, according to Tindale (1974), Enright (1932) and Elkin (1932) the proposal areas are situated within Worimi traditional lands. Enright (1932) and Elkin (1932) stated that the Worimi were divided into a number of clans or *nurra* and describe the Maaiangal clan area as extending along the coastline south of Port Stephens to the Hunter River and west to Tilligerry Creek. Based on these descriptions, the proposal areas are within Maaiangal lands.

Ethnohistoric accounts relating to other aspects of Worimi society (including spiritual beliefs and practices, initiation ceremonies, economy and subsistence, material cultural and the impacts of European settlement) are reviewed in detail by ERM (2006). Overall, ethnohistoric sources indicate that the Worimi had a system of established social organisation and beliefs and an economic system which predominantly utilised the rich coastal resources to support comparatively denser populations than those in the inland areas. No reference is made in the historical sources to the presence within the proposal areas of specific areas of cultural value to Aboriginal people such as birthing places or ceremonial grounds.

4.2 Archaeological Context

The majority of archaeological contextual information for the Stockton Bight region is derived from archaeological investigations conducted on behalf of DECC/National Parks and Wildlife Service or private developers. This information is reviewed below in relation to site specific

records held by DECC and the broader trends in the distribution of sites and archaeologically sensitive areas identified by previous archaeological investigations.

4.2.1 AHIMS Registered Sites

Under Section 91 of the NPW Act, it is an offence to fail to notify DECC of the location of an Aboriginal object. Aboriginal objects (grouped or individually depending on the circumstances) are generally registered as sites on the DECC Aboriginal Heritage Information Management System (AHIMS) database. A search of the AHIMS database reveals that 160 sites are registered within an area of 16 kilometres by 15 kilometres surrounding the proposal areas. Sites are listed on the AHIMS database according to site feature and may be registered as including a number of different features. The feature AFT (artefact) records the presence of artefactual material including stone, bone, shell and metal artefacts. Sites with this feature are typically stone artefact scatters (if they contain more than one artefact) or isolated artefacts (if they contain a single artefact). In this region, the features SHL (shell) or ETM (earth mound) may be combined with other features such as AFT and are generally used to denote midden sites (with the exception of burials, denoted by the feature BUR). The feature PAD (potential archaeological deposit) is often used for areas in which it is considered likely that artefacts are present below the ground surface. Potential archaeological deposits are not strictly archaeological sites as the presence of archaeological material has not yet been demonstrated.

Table 4.1 lists AHIMS registered sites according to site type, with middens (including those associated with stone artefacts) the most common site type, followed by artefact scatters. This is to be expected given the proximity of the area to estuarine and coastal resources. It is important to note the presence of three burial sites (AHIMS #38-1-0021, #38-4-0520 and #38-4-0063) in the active transgressive dune field within two kilometres north-east of the eastern boundary of the Lot 218 proposal area. Site #38-1-0021 is described as the remains of an adolescent or young female that was located in a swale between the foredune and active transgressive dune. The burial that comprises site #38-4-0520 was also that of an adolescent or young female and was located in either the active transgressive dune or Ridge II dune (the site card describes it as 'second line of dunes behind Stockton Beach'). The burial was associated with a dark grey soil matrix, with similar soil eroding out of the surrounding dune face. This burial is therefore likely to have been associated with a buried soil surface that was exposed and deflated due to transgressive dune activity. No further information was available on site #38-4-0063.

Table 4.1 – AHIMS Registered Sites within the Search Area

Site Type	Site Feature(s)	Number of Sites
Midden	SHL (shell), AFT (artefact) and SHL or AFT, ETM (earth mound) and SHL	113
Artefact scatter/isolated find	AFT	39
Burial	BUR (burial) or BUR and AFT	3
Scarred tree	TRE (modified tree)	2
Aboriginal Resource and Gathering	ARG (Aboriginal resource and gathering) and AFT	2
Potential archaeological deposit	PAD (potential archaeological deposit)	1
Total		160

When the AHIMS data is considered in terms of site distribution (refer to **Figure 4.1**), it is apparent that the majority of the registered sites within the Outer Barrier formation are located within the active transgressive dune field and the stabilised dune systems bordering

File Name (A4): R07_V1/1646_072.dgn

the Inter-Barrier depression. However, the distribution of identified sites is directly linked to the location and extent of archaeological investigations and thus the consideration of known site distribution alone does not provide an entirely accurate picture of how the landscape was used by Aboriginal people. The issue of site distribution will therefore be further discussed in relation to the findings of previous archaeological investigations, as discussed below.

4.2.2 Previous Archaeological Investigations

The Outer Barrier of Stockton Bight has been the subject of a large number of archaeological investigations (refer to Dean-Jones 1990, 1992; ERM 2001, 2003; Umwelt 2000), including those conducted within the proposal areas (Umwelt 2004a, 2004b, Worimi LALC 2003). The key findings of relevant investigations in relation to the current assessment are summarised below.

4.2.2.1 Dean-Jones (1990)

Dean-Jones (1990) undertook a detailed assessment of the nature and distribution of Aboriginal archaeological sites within both the Inner and Outer Barrier of Stockton Bight. In relation to the Outer Barrier, the archaeological material recorded by Dean-Jones (1990:126) was typically concentrated on ridgelines, spurs and low dunes associated with wetland areas. One of the primary objectives of this investigation was to identify areas of archaeological sensitivity within Stockton Bight. In doing so, Dean-Jones (1990) considered not only the distribution of known archaeological sites but also utilised predictive modelling (based on environmental factors) for those areas not subject to survey or where conditions were not conducive to site detection. The following geomorphic units within the Outer Barrier were assessed as having high archaeological sensitivity:

- the seaward margin of the active transgressive dunes and the landward margin of the deflation basin, with the assumption being that the majority of sites in this context were associated with former stabilised soil surfaces but have been exposed and/or deflated by dune transgression; and
- stabilised dunes bordering the Inter-Barrier depression; and
- estuarine shorelines (Dean-Jones 1990:126).

4.2.2.2 Assessments in the Fern Bay Area

Extensive archaeological investigations have been conducted within stabilised dune fields approximately 10 kilometres to the south-west of the proposal areas at Fern Bay (refer to Koettig 1987; Dean-Jones 1992; ERM 2001, in prep; MCH 2004, 2005a, 2005b). These investigations have involved survey, augering, test and salvage excavations, with sub-surface investigations primarily focused within the Ridge I dune field. The key aspects of these investigations are listed below.

- Ridge I dunes contained a relatively high frequency of sub-surface deposits comprised of shell and stone artefacts.
- Deposits were typically located at depths of between 30 and 60 centimetres, with the majority of shell material located in the upper layers, whilst stone artefacts became more common beneath the shell deposits.
- The Ridge II dune field contained relatively limited archaeological deposits however both the level of visibility and sub-surface investigation in this geomorphic unit were significantly lower than within the Ridge I dune field.

In relation to the current assessment, it is important to note that the Ridge I and Ridge II dunes within the Fern Bay area are of considerably lower elevation than the majority of those within the proposal areas.

4.2.2.3 Umwelt (2000)

Umwelt (2000) completed an Aboriginal archaeological assessment in relation to proposed mineral sand mining activities within two areas of the active transgressive dune field on Stockton Bight, one of which included Lot 218. Umwelt (2000) developed a number of hypotheses which they then examined on the basis of geomorphic information, previous archaeological records and targeted inspection of the large project area. As a result, they identified 33 sites within the project area and reached a number of conclusions regarding Aboriginal occupation of Stockton Bight, particularly in relation to the active transgressive dune field. These are summarised below.

- The dune fields along Stockton Bight would have been occupied during periods of stability (as demonstrated by the presence of archaeological material in association with soil profiles) and periods of instability. However, the intensity of occupation (and by association the volume of archaeological material deposited) during periods of instability would have been lower due to the lack of reliable or predictable resources (Umwelt 2000:8.1).
- There is circumstantial evidence that occupation evidence dating to periods of dune instability would be distributed throughout mobile sands and therefore will be less concentrated and will only form a distinct layer if the deposit is dense, rapidly buried and is not subsequently exposed (Umwelt 2000:8.6).
- Thus, for reasons relating to both site formation processes and the way in which Aboriginal people used the landscape, the majority of evidence identified within the active transgressive dune field is associated with former soil surfaces (Umwelt 2000:8.4). Umwelt (2000:10.12) therefore suggested that the most likely site type within the mobile dune field is 'diffusely scattered stone artefacts and shell (potentially heavily abraded).'
- Archaeological evidence is typically associated with two soil profiles likely to represent Ridge I and Ridge II periods of stabilisation, which, based on extrapolated geomorphic dates, formed between 4500-3000 years ago and 1200-300 years ago or less (Umwelt 2000:8.7).
- The identification of archaeological material is directly related to exposure and visibility therefore recorded site areas generally do not represent the full extent of a site but are defined by the area in which evidence has been both preserved and exposed (Umwelt 2000:8.1).
- Whilst occupation evidence may occur anywhere on former stable soil surfaces, Umwelt (2000:8.2) argued that archaeological deposits on elevated areas of the stable soil surfaces are generally not indicative of intensive occupation when compared to sites located in the former deflation basin area.
- It is suggested that larger and more complex sites are generally located in association with semi-permanent wetlands on inner margin of Outer Barrier in proximity to Inter-Barrier depression, low sand ridges adjacent to the former deflation basin and on the landward margin of the modern deflation basin (Umwelt 2000:8.2).

4.2.2.4 Umwelt (2004a)

The Lot 220 proposal area has been the subject of a previous archaeological assessment (Umwelt 2004a). The survey undertaken as part of this assessment involved the inspection areas of enhanced ground surface visibility within Lot 220, namely tracks and associated areas of clearance and resulted in the identification of two sites. Site Majors Flat Macka's Sand 1 (MFMS 1) was described as containing largely fragmented pipi, cockle and whelk shell and some whole shells dispersed across crests and upper slopes over an area of approximately 100 metres by 50 metres in the northern section of Lot 220 (refer to **Figure 4.1**). Three sites (A6, A7 and A8) had been previously identified in this area by ERM (2003) however Umwelt (2004a) considered that the distribution of shell material throughout the area was sufficient to define these exposures as a single site. The site was described as having been disturbed by the construction of a vehicle track and the placement of tank traps (Umwelt 2004a:5.4).

Site Majors Flat Macka's Sand 2 (MFMS2) was described as a lens of pipi and cockle extending for approximately one metre within a cutting along the side of a vehicle track within a low-lying area between two dunes. The shell material was located at a depth of approximately 5-15 centimetres below the current ground surface and was within a thin band of dark grey/black sand overlying bleached sand. Shell fragments were present within an area of approximately five metres by five metres across the ground surface. The site had been disturbed by track construction and on-going use by vehicles and horses (Umwelt 2004a:5.4-5.5).

These sites were assessed by the Worimi LALC and Worimi Traditional Aboriginal Elders and Owners Group to have been significantly disturbed and it was suggested that the material at MFMS2 was originally deposited upslope of its current location. The sites were assigned moderate Aboriginal cultural heritage significance (Umwelt 2004a:6.1). MFMS1 was assessed as being of low to moderate archaeological significance whilst MFMS2 was considered to have moderate to high archaeological significance, primarily due to the likelihood that additional deposits associated with this site may retain a degree of integrity and stratification (Umwelt 2004a:6.2-6.5). It was subsequently recommended that a Section 90 consent (involving salvage in the form of surface collection only) should be obtained for MFMS1 whilst sub-surface salvage should be conducted under a Section 90 consent at MFMS2 (Umwelt 2004a:7.1).

4.2.2.5 Umwelt (2004b)

This assessment involved a section of Lot 218, including the eastern half of the area currently proposed for impact. The survey undertaken for this assessment focussed on a proposed access track to the north of Lot 218 (outside of the current proposal area) but also assessed the potential archaeological and Aboriginal cultural heritage value of the remaining section of Lot 218. In relation to the current assessment, the most relevant aspect of Umwelt's (2004b) investigation was the identified potential for stable soil surfaces to be buried within Lot 218 and the recognition that it is not possible to accurately predict where these surfaces may occur. It was suggested that potential for buried soils is greatest in central and landward section of area but that sand extraction may expose new sites anywhere within Lot 218. Consequently, it was recommended (Umwelt 2004b:21) that, if sand extraction was to be undertaken in the central and landward section of the area, some archaeological investigation and monitoring should be conducted prior to impact. Furthermore, if additional Aboriginal cultural heritage material should be identified during the course of subsequent sand extraction, works should cease to allow the material to be properly assessed and managed in consultation with the Aboriginal stakeholders and the Department of Environment and Conservation (now DECC).

4.2.3 Summary

Previous archaeological investigations conducted within the Outer Barrier of Stockton Bight have produced a significant volume of information in relation to the distribution and nature of archaeological material within this region. On the basis of this information, a number of trends can be identified and these are summarised below.

- The majority of sites within the region consist of middens (containing beach and/or estuarine species) and stone artefact scatters, with sites varying from single artefacts to dense concentrations of material in both a surface and sub-surface context.
- Due to vegetation coverage and the nature of sand deposits, the detection of sites is directly related to levels of exposure and visibility. Sub-surface deposits may be at a considerable depth below the current mobile dune surface (in association with stabilised soil surfaces) and therefore are unlikely to be detectable unless significant disturbance has occurred.
- The Outer Barrier of Stockton Bight has undergone significant transformation over the last 6000 years comprising at least two major periods of stabilisation, resulting in the formation of stabilised soil surfaces across dune fields that include both elevated areas (dunes), adjoining slopes and a former deflation basin. These are referred to as Ridge I and Ridge II periods of stabilisation. In some areas, the Ridge I and Ridge II stabilised surfaces have undergone a cycle of burial, deflation and sometimes reburial, resulting in a discontinuous and unpredictable distribution of stabilised soil surfaces beneath wind-blown sand deposits.
- Archaeological material (including burials) within the active transgressive dune field and current deflation basin primarily consists of exposed and/or deflated deposits that were once associated with former stabilised surfaces linked to Ridge II and presumably Ridge I periods of stabilisation. Although some archaeological material may have been deposited during periods of instability (i.e. not in association with a stable soil surface), this material is likely to have been limited in both extent and distribution.
- Within the stabilised dune fields, it is suggested that greater concentrations of archaeological material (in terms of site numbers and artefact densities) are located on low ridgelines, spurs and low dunes associated with wetland resources.

4.3 Predictive Model

The development of a predictive model is an essential component of any archaeological assessment. It assists in identifying focal areas for survey effort and providing an indication of the site types common to the area but is also critical in assessing the likelihood that archaeological material may be present but not visible. The majority of archaeological surveys are undertaken in areas where vegetation or other factors limit ground surface visibility and thus reduce the chances that any archaeological materials that may be present on the surface will be detectable. Furthermore (and perhaps more importantly), surface survey alone does not take into account the possibility that archaeological materials may be present in a sub-surface context.

Based on the archaeological and environment context of the proposal areas, the following predictive model has been established.

- Middens containing beach or estuarine shell and sites containing stone artefacts are the most likely site types however burials may also be present, as may scarred trees within the Lot 220 proposal area.
- The majority of sites will be associated with a former stabilised surface dating to the Ridge I or Ridge II period of stabilisation.
 - Within the Lot 218 proposal area (including the adjoining access road), these surfaces will generally be buried beneath the active transgressive dune, significantly reducing the likelihood that any sites that they may contain will be detectable during the current survey. Based on topographic mapping of the area, the former stabilised elevated Ridge I (and possibly Ridge II) dunes are located within the north-western portion of the proposal area and therefore it is predicted that the stabilised soil surfaces will be closer to the current dune surface in this portion of the proposal area.
 - The Lot 220 proposal has not been subject to active transgression and thus stabilised surfaces will be close to the current ground surface and should be present across the entirety of the proposal area.
- Within the Lot 218 proposal area (including the adjoining access road), it is highly unlikely that archaeological materials will be detectable within the mobile sands (where not associated with a former stabilised surface). Furthermore, as the mobile sands within this proposal area were deposited over approximately the last 50 years, it is not possible for them to exhibit the original depositional context for any archaeological material.
- Archaeological material may occur in any landform but large sites (in terms of both areal extent and densities of archaeological material) will be more likely to occur on slightly elevated ridgelines, spurs and low dunes associated with areas containing freshwater or estuarine resources.
 - It is very difficult to determine the location of any such landforms within the Lot 218 proposal area (including the adjoining access road) due to the burial of the stabilised surfaces by wind-blown sand.
 - The central portion of the Lot 220 proposal area is comprised of a system of low relief dunes (with associated swales) that fit with the description of an area likely to contain large sites. This is supported by the presence within this area of a site (MFMS 2) considered to potentially contain stratified sub-surface deposits. In contrast, the Ridge I and Ridge II dunes within this proposal area are relatively high and steep and would be expected to contain limited evidence of occupation by Aboriginal people, similar to that identified at MFMS 1.

In summary, the Lot 218 proposal area (including the access road) is predicted to contain few visible sites. Archaeological material that does occur is likely to consist of midden material or stone artefact scatters but may also include burials. Any visible archaeological material will be or will have been associated with a former stabilised surface that was buried but is being or has been exposed in the course of dune transgression. It is not possible to further delineate where larger sites may occur within this proposal area as the topography of the former stabilised surfaces is not apparent.

Archaeological material (again generally comprising stone artefacts and/or estuarine or marine shell) may be present within any landform in Lot 220 but it is predicted that sites with greater concentrations of archaeological material will be present within low relief dunes in the central portion of the proposal area. Archaeological material may not be visible on the ground surface but may be present in a sub-surface context, particularly within this central area. Scarred trees and burials may also be present within this assessment area.

5.0 Survey Methodology and Results

The survey of the Lot 218 proposal area was conducted on 14 July 2008 and the survey of the Lot 220 proposal area was conducted on 18 July 2008. The survey team consisted of Nicola Roche (Senior Archaeologist, Umwelt), Anthony Anderson (Mur-Roo-Ma Inc.), Jamie Merrick (Worimi LALC) and Leanne Anderson (Nur-Run-Gee Pty Limited). This section outlines the survey methodology and provides the survey results.

5.1 Survey Methodology

In developing an appropriate survey methodology for each of the proposal areas, a number of factors were taken into consideration, namely: relevant DECC reporting guidelines and requirements; the impacts associated with the proposal; the vegetation coverage and likely levels of exposure and visibility within the proposal areas; and the predictive model outlined in **Section 4.3**. In accordance with DECC requirements, the survey methodology outlined below was provided to the relevant Aboriginal stakeholders for comment prior to the commencement of survey. No objections were raised in relation to the survey methodology.

The Lot 218 proposal area is comprised of recently deposited windblown sands within which it is highly unlikely that Aboriginal objects will be preserved or visible. However, these mobile sands have transgressed over at least one (and possibly two) former stabilised surfaces. Survey of this proposal area therefore focused on the interface of the mobile sands and the stabilised dune in order to consider whether any former stabilised dune surfaces, which may have been associated with Aboriginal objects, will be subject to impact by the proposal. The access road that forms part of this proposal area and passes across Lot 227 for approximately 50 metres was not inspected as it does not include any areas of clear interface between mobile sands and stabilised dune surface.

The Lot 220 proposal area is extremely heavily vegetated, with vegetation and the associated leaf litter likely to severely impede ground surface visibility and prevent exposure of the sub-soil, thereby limiting the likelihood that Aboriginal objects will be detectable. This is supported by the results of previous archaeological assessments (Umwelt 2004a; ERM 2003). The survey therefore focused on areas of enhanced visibility and exposure in the form of vehicle and equestrian tracks. These tracks traverse the full range of landform elements within the Lot 220 proposal area, therefore providing an appropriate sample of the area (within the identified visibility and exposure limitations). The range of landforms, Aboriginal resources and levels of disturbance both within the surveyed areas and within the adjoining parts of Lot 220 were recorded to facilitate the assessment of the archaeological potential of those parts of the Lot 220 proposal area with limited visibility and exposure.

The geomorphic unit(s), levels of exposure and vegetation types were recorded for each transect. Visibility was recorded in terms of the percentage of ground surface upon which artefacts may be sighted. Exposure was also recorded as the percentage of the survey transect in which disturbance has removed or exposed the upper soil layer to permit the detection of artefacts (if any) that were formerly located in a sub-surface context (NSW NPWS 1997:18). In accordance with NPWS's *Cultural Heritage Guidelines* (NSW NPWS 1997), the description of survey coverage includes the transect area and the estimate of exposure and visibility within that transect. Effective coverage was then calculated by multiplying the transect area by the percentage of exposure and visibility within the transect (i.e. effective coverage = area by % exposure by % visibility).

5.2 Results

The survey of the Lot 218 proposal area was undertaken in two transects, as shown in **Figure 5.1**. A description of each survey transect and a calculation of effective coverage are provided in **Table 5.1**.

The survey of the Lot 220 proposal area was undertaken in nine transects. With the exception of Transect 9, all transects followed existing vehicle and survey tracks within Lot 220, as marked on **Figure 5.2**. A detailed description of these transects is provided in **Table 5.2**.



Source: Aerial: Google Earth, 2008

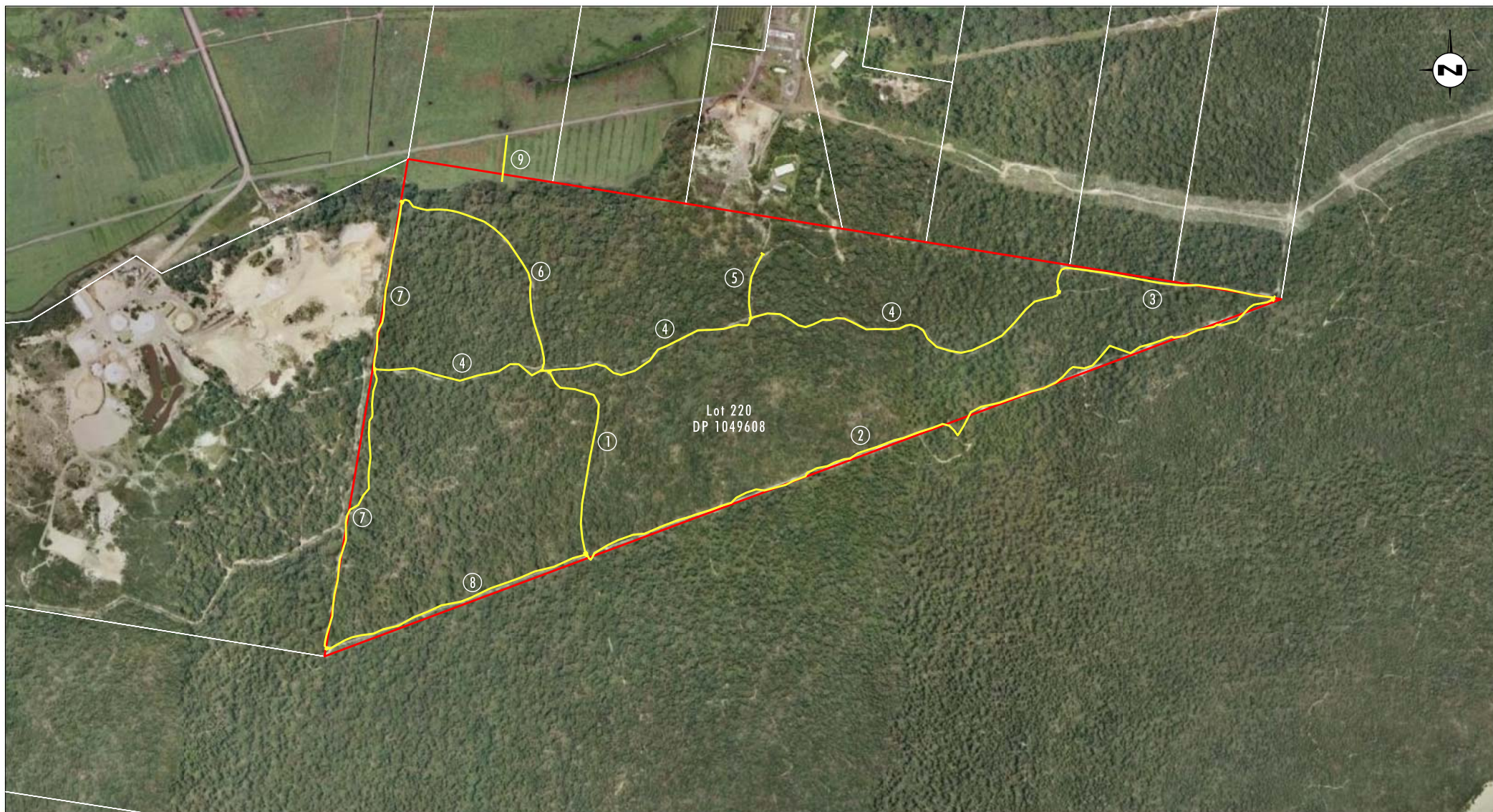
0 0,5 1 1,25 km
1:25 000

Legend

- Lot 218 Boundary
- Proposed Lot 218 Operational Area
- Surveyed Transect

FIGURE 5.1

Location of Surveyed
Transects within Lot 218



Source: Aerial: Google Earth 2008

0 100 250 500m
1:10 000

Legend

- Lot 220 Boundary
- Surveyed Transect

FIGURE 5.2

Location of Surveyed
Transects within Lot 220

Table 5.1 – Survey Transects with the Lot 218 Proposal Area

Transect	Area (m ²)	Geomorphic Unit/Landforms Category	General Description	Exposure Types	% exp	% vis	Effective Coverage (m ²)
1	55,880	Active transgressive dune field.	Transect 1 began approximately 400 metres west of the Oakfield Track and extended 2300 metres north-west to the junction with the tank traps track. This transect was comprised of predominantly level dune crests, with discrete areas of steeper slopes between crests that are not apparent from the available contour data. Sections of lower elevation are interspersed with high dune crests located approximately 20 metres above the stabilised vegetated surface to the north of the proposal area (refer to Plate 1). Ground surface visibility within Transect 1 was extremely high at 100 per cent across much of the area, with visibility only limited in some small areas of remnant vegetation (see Plate 2), such that average ground surface visibility within the transect was approximately 95 per cent. However, there was only one area of exposure suitable for the detection of any buried stable soil surfaces that may have been present. This was comprised of an area within which the stabilised dune surface outside the proposal area is at relatively high elevation and the coverage of wind-blown sand within the proposal area is subsequently thinner. A small remnant dune is present and is linked to the stabilised dune by an area of exposed former stabilised soil surface, within which site Mackas 1 was visible (refer to Plate 3 and Section 5.2.2 below). This area of exposure was approximately 30 metres by 40 metres in size. Additional shell material was present within this survey transect however it consists of recently deposited oyster shell and does not comprise archaeological material (refer to Plate 4).	Minor stabilised soil surface	1	95	531
2	16,320	Active transgressive dune field.	Transect 2 extended for approximately 800 metres within the western section of the Lot 218 proposal area and was comprised of level dune crests separated by slopes of very gentle to moderate inclination. The eastern and western extremities of Transect 2 are located in areas of considerable elevation with a lesser coverage of wind-blown sand than the surrounding low-lying areas (refer to Plate 5). However, there were no exposures of stabilised soil surfaces present in Transect 2 although a small area within which dead tree stumps were visible was recorded, indicating that the former stabilised soil surface is covered by a relatively thin layer of wind-blown sand (see Plate 6). Visibility within this transect was again high at 95 per cent.	None	0	95	0
Total	72,200						531



PLATE 1
View across Transect 1 east of the Oakvale Track
Facing north-east



PLATE 2
Swale within active dune containing some remnant vegetation within Transect 1
Facing north-east



PLATE 3
View towards Mackas 1 showing stabilised dune, remainie dune,
exposed soil surface and encroaching mobile dune
Facing south



PLATE 4
Remains of recent campfire with oyster shell
Facing east



PLATE 5
Active dune transgressing over stabilised dune surface
Facing south



PLATE 6
Remains of vegetation on stable surface covered by mobile dune
Facing south-east

Table 5.2 – Survey Transects within the Lot 220 Proposal Area

Transect	Area (m²)	Geomorphic Unit/Landforms Category	General Description	Exposure Types	% exp	% vis	Effective Coverage (m²)
1	946	Gently inclined to moderately steep slopes leading to level crests within Ridge II dunes.	Transect 1 follows the existing tank traps track south from the centre of Lot 220 to the southern boundary of the area (see Plate 7). The track appears to be relatively frequently used and visibility is high, limited only by leaf litter. The use of the track by vehicles has resulted in limited exposure of darker sands however no large areas of stabilised soil surface exposure were present.	Vehicle track	10	80	76
2	1,432	Level ridge crests separated by slopes of moderate to steep inclination within Ridge II dunes.	Transect 2 follows the boundary of Lot 220 from the junction with the tank traps track north-east to the eastern corner of the proposal area. This vehicle track is slightly narrower than Transect 1 but levels of visibility and exposure are comparable. The Ridge I dunes within this transect represent some of the most elevated dunes within Lot 220, with slopes of significant inclination (refer to Plate 8).	Vehicle track	10	80	172
3	880	Slopes of moderate inclination within Ridge II dunes leading to area of low relief dunes and swales between Ridge I and Ridge II dunes.	Transect 3 begins at the eastern corner of Lot 220 and extends along the northern boundary before turning south to link into Transect 4. This transect includes a large area of low relief dunes and swales that are not detectable from the available contour data (refer to Plate 9). Levels of exposure and visibility within this transect are comparable with those of preceding transects.	Vehicle track	10	80	70
4	2,794	Level area with low relief dunes and swales separating Ridge I and Ridge II dunes.	Transect 4 extends within the central portion of Lot 220 in the area of low relief dunes and swales (refer to Plate 10) and contains sites MFMS2 and MFMS3. Levels of exposure and visibility within this transect are comparable to those of the proceeding transects.	Vehicle track	10	80	224
5	123	Very gently inclined to gently inclined slopes leading to Ridge I dunes.	Transect 5 is comprised of a narrow track primarily used by horses that extends from the central portion of Lot 220 to the northern boundary. The sand within this transect is darker, indicating a slightly higher level of exposure (see Plate 11) however no sites were identified in this transect.	Minor track	20	80	20



PLATE 7
Transect 1 midway from centre point to southern boundary
Facing south



PLATE 8
View along Transect 2 showing steeply inclined slopes to high dune crests
Facing south-west



PLATE 9
View adjacent to Transect 3 showing localised low dune ridges and swales
Facing south-south-west



PLATE 10
View along Transect 4 at junction with Transect 5
Facing south-west



PLATE 11
View along Transect 5
Facing north

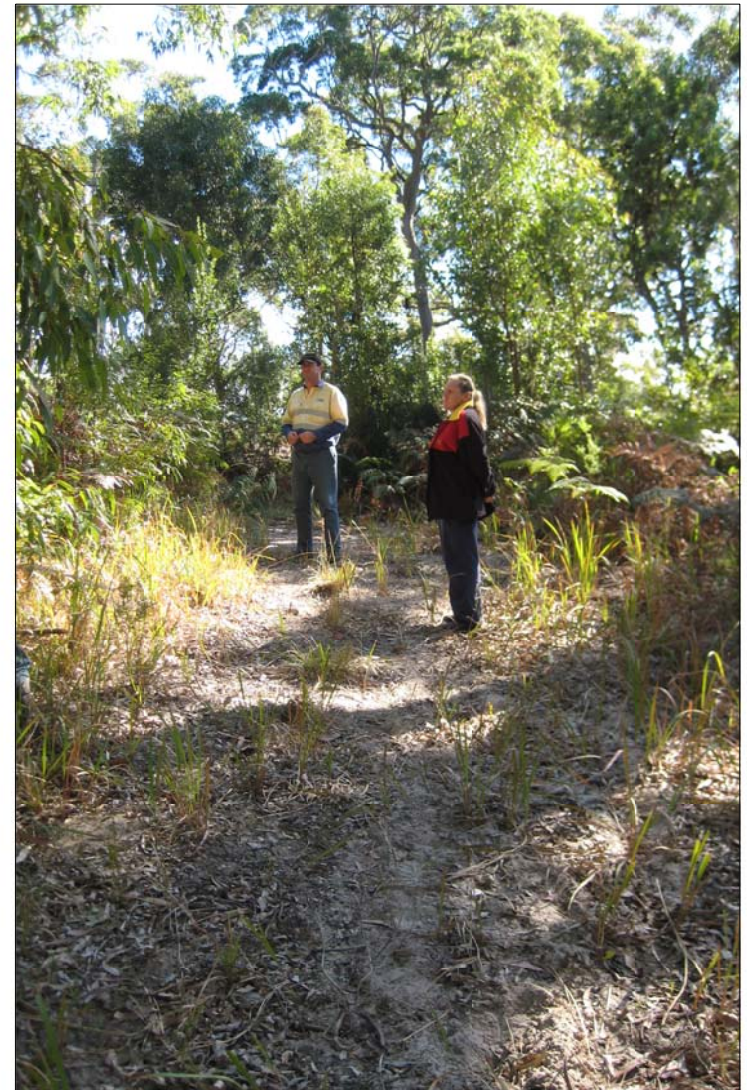


PLATE 12
Section of Transect 6 in which low density fragmented shell is present
Facing north-north-west

Table 5.2 – Survey Transects within the Lot 220 Proposal Area (cont)

Transect	Area (m²)	Geomorphic Unit/Landforms Category	General Description	Exposure Types	% exp	% vis	Effective Coverage (m²)
6	710	Gently inclined to moderately inclined slopes leading to Ridge I dune bordering Inter-Barrier depression	Transect 6 consists of the northern section of the tank traps track. This section of the track is of variable width and extends from the central portion of Lot 220 to the north-western corner and ascends a Ridge I dune that is bordered by moderately inclined slopes leading to the Inter-Barrier depression and the area of low relief in the centre of Lot 220. Visibility within this transect is comparable to the preceding transects however the level of exposure (as evidenced by the presence of darker sands) is slightly lower. Transect 6 passes through the area of MFMS2 (see Plate 12).	Vehicle track	5	80	28
7	855	Gently to moderately inclined slopes to both Ridge I and Ridge II dune crests separated by area of low relief dunes and swales	Transect 7 started from the north-western corner of Lot 220 along the western boundary of the proposal area. Visibility within this transect was somewhat limited by leaf litter (see Plate 13) however shell fragments (forming part of MFMS1) were present within the northern section of this transect. Transect 7 continues to the south-western boundary of the proposal area.	Minor track	10	60	51
8	767	Level crests on Ridge I dunes separated by gently to moderately inclined slopes	Transect 8 extends from the south-western boundary of the proposal area to the junction with the tank traps tracks (Transect 1). Levels of visibility and exposure within this transect were comparable to those of Transects 1-4.	Minor track	10	80	61
9	3,600	Inter-Barrier depression	Transect 9 is comprised of a small area of the Inter-Barrier depression that extends from an existing electricity easement to the boundary of Lot 220. It is extremely low-lying marshy ground with no exposures and very limited visibility (see Plate 14).	None present	0	5	0
Total	12,822						702



PLATE 13
View along northern section of Transect 7 in area containing
exposures of very low-density fragmented shell
Facing south-west



PLATE 14
Transect 9 showing proposed access route from electricity easement to Lot 220
Facing north

5.2.1 Effective Coverage

The level of effective coverage in the Lot 218 proposal area was low at 0.73% of the surveyed area, which equates to 0.05% of the entire proposal area. In comparison, effective coverage within Lot 220 appears relatively high at 5.5% of the surveyed area but, when calculated for the entire proposal area is very low at approximately 0.09%. Within the Lot 218 proposal area this is a result of the presence of large wind-blown sand deposits and the subsequent lack of exposure whereas in the Lot 220 proposal area, low effective coverage is a result of both heavy vegetation and limited exposure. Thus, an increase in survey effort in either of the proposal areas would not have improved the level of effective coverage. This heightens the need to apply the predictive model to the results of the survey to assess the likelihood that potential archaeological deposits will be present within the proposal areas, as will be discussed below.

5.2.2 Archaeological Sites

5.2.2.1 Lot 218 Proposal Area

One archaeological site, Mackas 1 (MGA coordinates 398600 6368393), was identified within the Lot 218 proposal area (refer to **Figure 5.3**). This site is comprised of an area of stabilised soil surface extending from an elevated stabilised dune into the active transgressive dune field. The area of exposed soil surface measures approximately 30 metres by 40 metres and is comprised of dark grey black sand containing frequent charcoal flecks and fragments that overlies a mid orange sand in some areas (refer to **Plate 15**). The site contains five stone artefacts at the locations listed in **Table 5.3**.

Table 5.3 – Location of Stone Artefacts within Mackas 1

Artefact No.	E (MGA)	N (MGA)	Artefact Class	Raw Material
1	398598	6368394	Flake	Nobbys tuff
2	398598	6368398	Flake	Nobbys tuff
3	398599	6368393	Flake	Nobbys tuff
4	398599	6368392	Broken flake	Nobbys tuff
5	398579	6368375	Manuport	Coarse-grained igneous

The site also contains several bone fragments (including fish bone, as shown in **Plate 16**) and scattered shell that is difficult to identify due to heavy weathering but appears to be pipi. Mackas 1 has been disturbed by vehicle activity but it is likely that the stabilised surface continues outside the area of exposure and may have been protected from impacts by wind-blown sand.

5.2.2.2 Lot 220 Proposal Area

The Lot 220 proposal area contains three sites, two of which (MFMS 1 and MFMS2) were identified during a previous archaeological assessment (Umwelt 2004a). Both of these sites were located during the current survey however the fragmented shell material that comprises these sites is considerably more sparse than when initially recorded. Due to the presence of low density scatter outside the previously mapped site boundary for the MFMS1, this site has been extended to the south (refer to **Figure 5.4**).

A new site, MFMS3 (MGA coordinates 398995 6370285), was identified within the central portion of Lot 220. A low density scatter of fragmented shell was dispersed along a track exposure, which also contained one area of concentrated shell deposit (including whole pipi



Source: Aerial: Google Earth, 2008

0 0,5 1 1,25 km
1:25 000

Legend

- ▬ Lot 218 Boundary
- ▬ Proposed Lot 218 Operational Area
- Midden

FIGURE 5.3

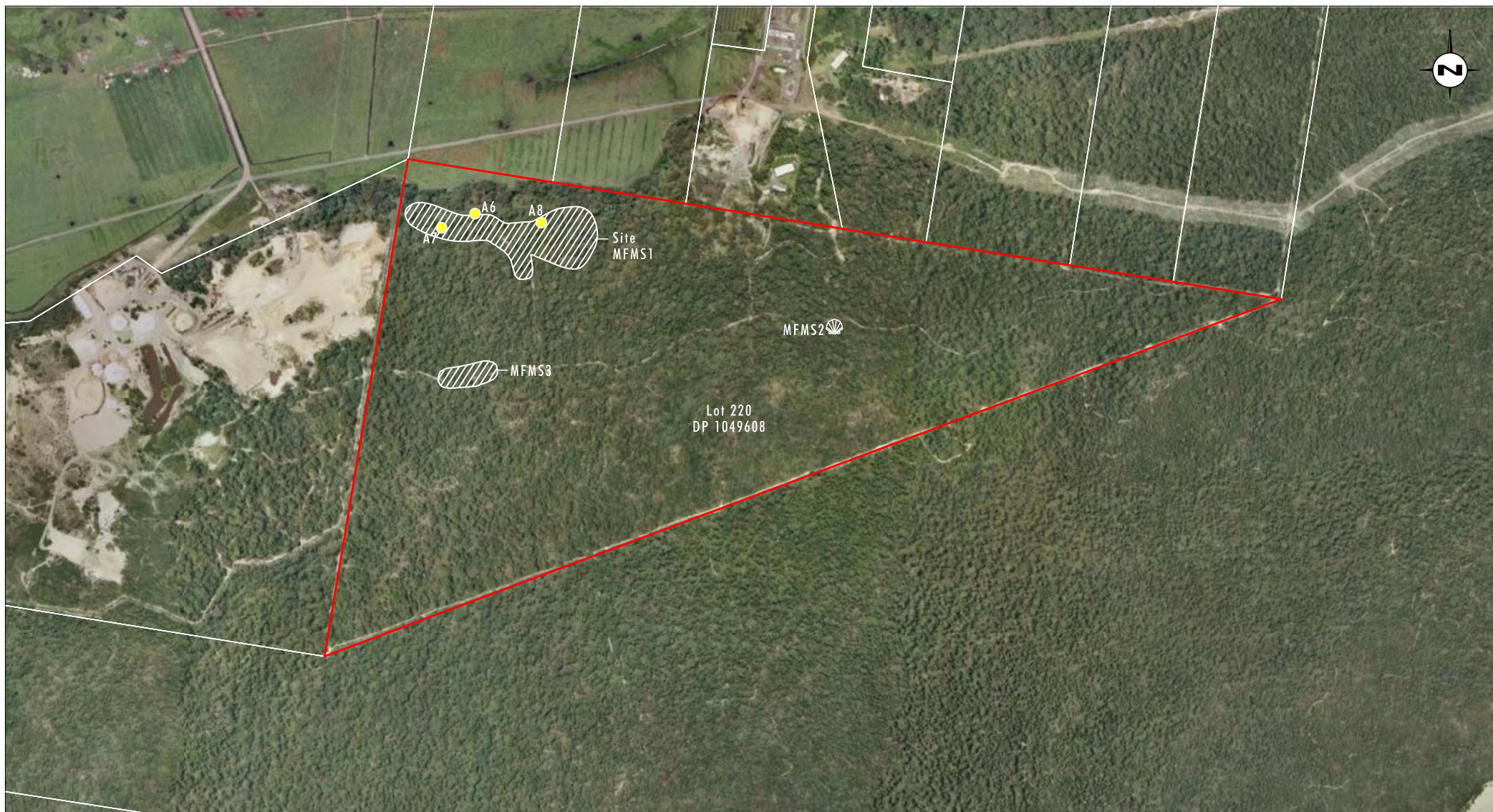
Location of Recorded Sites in
Lot 218 Operational Area



PLATE 15
Site Mackas 1
Facing north-north-east



PLATE 16
Nobbys tuff flake and fish bone fragment from site Mackas 1



Source: Aerial: Google Earth 2008

0 100 250 500m
1:10 000

Legend

- Lot 220 Boundary
- Previously Recorded Artefacts
- Shell

FIGURE 5.4

Location of Recorded
Sites within Lot 220

shell) associated with dark grey black sand exposed via animal burrowing (see **Plate 17**). The area of concentrated shell deposit is present on a low relief dune and it is likely that the other shell fragments within this site also originate from this landform but have been disbursed by on-going use of the track. Importantly, the presence of a concentration of pipi shell in association with small amounts of a sand matrix typical of stabilised soil surfaces indicates that relatively intact and possibly comparatively dense midden deposits may be present in a sub-surface context within this area. Furthermore, the site contains fragments of cockle and whelk in addition to pipi shell, indicating that MFMS3 contains evidence of the use of both beach and estuarine resources.

No scarred trees were recorded within Lot 220 however, due to the level of vegetation it was not possible to inspect the bulk of trees within the Lot 220 proposal area.

5.2.3 Potential Archaeological Deposit

As discussed in **Section 4.3**, the detection and identification of archaeological material is closely related to levels of exposure and visibility, that is, archaeological material that is obscured by vegetation or is beneath the ground surface will not be recorded during an archaeological survey. For the purposes of archaeological assessment and cultural heritage management, the likelihood that artefacts may be present below the ground surface has important archaeological and legislative implications for any proposed land use. The level of effective coverage within the project area was low (refer to **Section 5.2.1**) and therefore it is necessary to address the possibility that potential archaeological deposits will be present.

The term 'potential archaeological deposit' (PAD) can be defined in a number of different ways. However, the primary archaeological importance of sub-surface deposits is the possibility that they will provide information that can be used to interpret changes in the archaeological record through time and space. Consequently, for the purposes of this assessment, a landform or area will only be designated as a PAD if it meets one or more of the following criteria:

- it should be likely that the PAD will contain enough archaeological material to allow for statistically viable detailed analysis and comparison of the artefact assemblage both within and between sites;
- the PAD should not have been significantly disturbed and should retain a degree of archaeological integrity; and
- it is predicted that the PAD should contain materials that can be dated, either in relative or absolute terms.

5.2.3.1 Lot 218 Proposal Area

The active transgressive dune that comprises the surface context across the overwhelming majority of the Lot 218 proposal area (including the proposed access track) has been deposited over approximately the last 50 years and therefore will not contain archaeological materials in their original depositional context and is not a PAD. However, the Lot 218 proposal area contains at least one area of stabilised soil surface associated with site Mackas 1 and this soil surface is likely to continue outside the site exposure. Although it is not possible to determine the location of the former deflation basin during this period of stabilisation, Mackas 1 is located on level surface extending from a dune ridge of relatively low elevation, a landform context of the type that may contain relatively high concentrations of archaeological material. For this reason, the stabilised soil surface associated with Mackas 1 is considered a PAD.



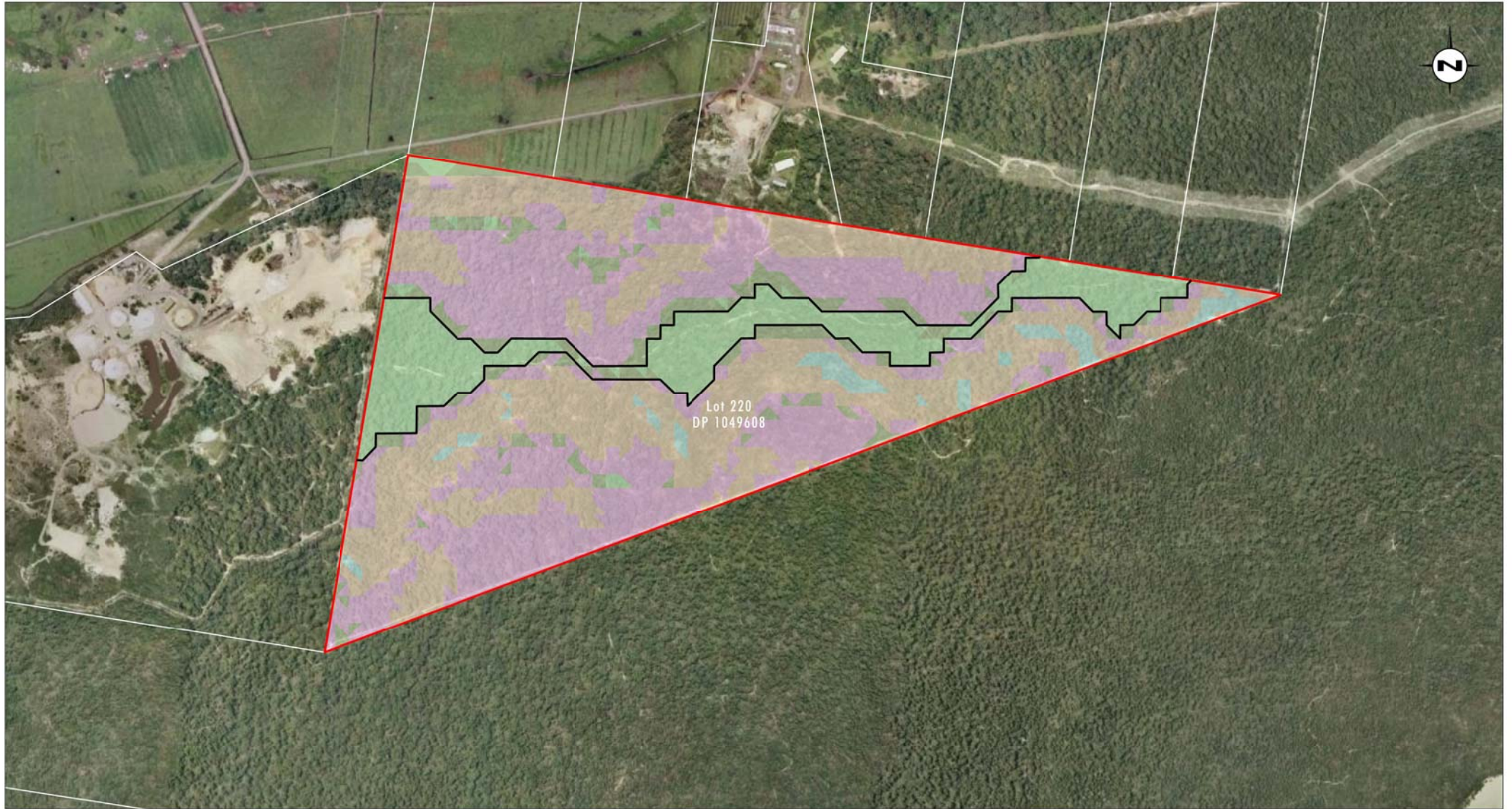
PLATE 17

Site MFMS3 containing shell material (including whole pipi) exposed by animal burrowing

Based on the findings of previous assessments, it is also likely that additional areas of stabilised soil surface will be present below the active transgressive dune. Due to the complex geomorphic history of this region, it is not possible to predict with any certainty where such soil surfaces will be located nor is it possible to determine their original landform context. Thus, whilst a stabilised soil surface may be present, it may have comprised the crest of a dune of high elevation, which predictive modelling indicates is unlikely to contain archaeological materials of a nature or extent that justifies their designation as a PAD. Conversely, it may represent a level dune ridgeline of low elevation associated with a former wetland and therefore is more likely to contain concentrations of archaeological materials that warrant its recognition as a PAD. Consequently, the identification of areas of PAD (with the exception of that associated with Mackas 1) within the Lot 218 proposal area is extremely problematic. For this reason, no areas of PAD have been identified within the Lot 218 proposal area. However, as the proposed operations proceed, it is likely that stabilised soil surfaces will be exposed to a greater extent and can be assessed as to whether they constitute a PAD. A mechanism for undertaking this assessment is provided in **Section 8.2**.

5.2.3.2 Lot 220 Proposal Area

Lot 220 is primarily comprised of Ridge I and Ridge II dunes of relatively high elevation with slopes of an inclination that makes them unsuitable for occupation. Thus, whilst archaeological material may be present across these landforms (as evidenced by MFMS1), it is unlikely that it will occur in sufficient densities to warrant designation as a PAD. In contrast, low relief dunes that provide access to low-lying areas and associated freshwater resources have been identified as having a high likelihood of containing concentrated deposits of archaeological material that may retain a degree of stratification. Landforms of this type are present throughout the central portion of Lot 220 and the presence of associated archaeological material in a sub-surface context is demonstrated at site MFMS 3. As the level of topographic information is not sufficient to distinguish the low relief dunes from adjoining swales, this central area is designated as a PAD in **Figure 5.5** however it is noted that it is the low-relief dune ridges and not the swales that comprise the PAD.



Source: Aerial: Google Earth 2008

0 100 250 500m
1:10 000

Legend

Lot 220 Boundary
PAD

Slope Analysis

Level
Very gentle incline
Gentle incline
Moderately inclined
Steep

FIGURE 5.5

Area of PAD within Lot 220

6.0 Significance Assessment

The assessment of cultural significance is critical in establishing mitigation and management strategies for cultural heritage (refer to Pearson and Sullivan 1995:21). Cultural significance is defined by the Burra Charter in terms of aesthetic, scientific, historic and social values. In NSW Aboriginal cultural heritage is typically assessed according to its social and scientific significance (in accordance with the NSW NPWS Guidelines for Archaeological Report Writing 1997). There a number of relevant criteria to be considered when assessing significance and these are defined below.

6.1 Aboriginal Cultural Significance

In assessing Aboriginal heritage, social significance is primarily equated with the significance placed on cultural (and sometimes natural) heritage by Aboriginal people and is often referred to as Aboriginal cultural significance. Aboriginal people value their heritage for a range of reasons, some of which are unique and some of which may be shared with non-Aboriginal people. Thus, Aboriginal people may consider a site containing archaeological material important for reasons related to its archaeological value but may also see the site as a tangible aspect of their culture that provides a direct link to Aboriginal people in the past. In contrast, sites, places or landscapes may be of significance to Aboriginal people for reasons not linked to the presence of tangible archaeological materials such as the presence of places of spiritual importance, significant resources or important natural features.

As Aboriginal cultural significance relates to the values of a site, place or landscape to Aboriginal people, it must be determined by Aboriginal people. A draft copy of this report was provided to all relevant Aboriginal stakeholders on 15 August 2008 and it was requested that comment be provided regarding the Aboriginal cultural significance of the sites and areas of PAD within the proposal areas and on the significance of the proposal areas as a whole. Mur-Roo-Ma indicated that the proposal areas are significant to Aboriginal people as part of the Stockton Bight landscape. Aboriginal stakeholders have previously indicated that Stockton Bight is of very high Aboriginal cultural significance due to its social, spiritual, aesthetic and educational value to the Aboriginal community (refer to ERM 2006). The proposal areas are therefore considered to have high Aboriginal cultural significance.

6.2 Archaeological Significance

The Burra Charter defines the archaeological significance of an Aboriginal site, object or place according to its potential to address research questions and provide greater insight into Aboriginal society and chronological changes in how Aboriginal people utilised the landscape and its resources (Australian ICOMOS Incorporated 2000:12). The major concepts underlying archaeological significance relate to the rarity and representativeness of a site, its integrity, intactness and overall research potential. Each of these concepts is relatively self-explanatory, however the concept of representativeness warrants further discussion. Representativeness is closely linked with rarity and relates to the degree to which a site encapsulates the typical aspects of sites of its type at a local, regional and, in some cases, national level. In simple terms, representative value should be considered in terms of whether a site embodies the essential characteristics of sites of that type in the locality and region and whether sites of that type remain extant in a context that will allow for their continued conservation. The criteria for the assessment of archaeological significance are provided below.

6.2.1 Archaeological Significance Assessment Criteria

The criteria applied to the assessment of archaeological significance are listed in **Table 6.1**.

Table 6.1 – Criteria for Assessment of Archaeological Significance

Criterion	Low	Moderate	High
Rarity	The location of the site within the landscape, its type, integrity, contents and/or potential for sub-surface artefacts, are common within the local and regional context.	The location of the site within the landscape, its type, integrity, contents and/or potential for sub-surface artefacts, are common within the regional context but not the local context.	The location of the site within the landscape, its type, integrity, contents and/or potential for sub-surface artefacts, are rare within the local and regional context.
Representativeness	This site, when viewed in relation to its type, contents, integrity 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 conservation within the region.	This site, when viewed in relation to its type, contents, integrity 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 conservation within the region.	This site, when viewed in relation to its type, contents, integrity 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 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.	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 sub-surface investigation of the site, even if it is unlikely that any useful chronological evidence survives.	The site appears relatively undisturbed and there is a high possibility that useful spatial information can still be obtained from sub-surface investigation of the site, even if it is still unlikely that any useful chronological evidence survives. (In cases where both spatial and chronological evidence is likely to survive the site will gain additional significance from high scores for rarity and representativeness).
Connectedness	There is no evidence to suggest that the site is connected to other sites in the local area or the region through: <ul style="list-style-type: none"> • their chronology (rarely known); and • 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). 	There is some evidence to suggest that the site is connected to other sites in the local area or the region through: <ul style="list-style-type: none"> • their chronology (rarely known); and • 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). 	There is good evidence to support the theory that the site is connected to other sites in the local area or the region through: <ul style="list-style-type: none"> • their chronology (rarely known); and • 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).

6.2.2 Assessment of Archaeological Significance

In relation to the proposal areas, the assessment of archaeological significance has two components: the archaeological significance of sites and PADs (if any) identified within each proposal area; and the archaeological significance of each proposal area as a whole. The application of the archaeological significance criteria to sites and PADs is relatively straightforward however the assessment of the significance of each proposal area as a landscape warrants further discussion. A cultural landscape can be defined as the connection between Aboriginal heritage (including sites and features and their relationships) and the natural elements of the landscape such as landscape history, topography and flora and fauna. Using this approach, archaeological material comprises one element of a cultural landscape and the significance of this landscape may be separate from that of the sites or features that it contains (ERM 2006:101).

6.2.2.1 Mackas 1

Mackas 1 is a midden site containing pipi shell and stone artefacts composed primarily of Nobbys tuff. These archaeological materials are associated with a stabilised soil surface exposed within the active transgressive dune field. The site has been impacted by vehicles however the stabilised soil surface may continue in a less disturbed context outside the area of exposure. As discussed in **Section 4**, sites of this type and with a similar array of site contents, level of integrity and potential for additional sub-surface deposits are common within the Stockton Bight active transgressive dune field and are present within the Worimi Conservation Lands, which will be conserved in perpetuity. There is no evidence to directly connect this site to any other sites within the surrounding area, except as part of a broader cultural landscape, which will be addressed in **Section 6.2.2.5**. Thus, the visible site exposure at Mackas 1 has low archaeological significance in relation to its rarity, representativeness, integrity and connectedness. However, the stabilised soil surface associated with Mackas 1 (but outside the visible site exposure) is considered to have moderate potential to contain sub-surface archaeological material at relatively high concentrations and may contain a complex assemblage or features. For this reason Mackas 1 is assessed as having moderate archaeological significance.

6.2.2.2 MFMS 1

MFMS 1 is a dispersed scatter of fragmented shell located on an elevated Ridge I dune that is not considered to constitute a PAD. Midden sites of this type are relatively common within the Ridge I dune field, with similar landform contexts that are likely to include similar sites incorporated within the Worimi Conservation Lands. MFMS 1 therefore has low archaeological significance when assessed against the criteria of rarity, representativeness, complexity, connectedness and PAD. The site is present within a vehicle track and has been subject to a degree of disturbance however it is possible that archaeological materials are present within the surrounding areas where impacts have been minimal and these areas may retain a degree of integrity. MFMS1 is therefore assessed as having low to moderate archaeological significance.

6.2.2.3 MFMS2 and MFMS 3 and the PAD within the Central Portion of Lot 220

The significance of these sites and area of PAD will be assessed together as they are part of the same landform context with the same level of archaeological potential and a high likelihood of containing similar deposits of archaeological material. Archaeological material that is present within the sites and is predicted to occur within the area of PAD consists of shell midden material that has moderate potential to contain concentrated sub-surface deposits that may retain stratigraphic integrity and may provide information that can address research questions regarding how Aboriginal people utilised this area. In particular, the

evidence from MFMS 2 and MFMS 3 indicates that both estuarine and beach resources were utilised in this area and that it may constitute a transitional area between major resource zones. However, sites of this type and within this landform context have been identified within other areas of the Outer Barrier of Stockton Bight and this landform context is preserved within the Worimi Conservation Lands. Furthermore, there is no clear evidence to hypothesise about connectedness between these sites and others within a similar context. Consequently, whilst the PAD and associated sites within the central portion of Lot 220 are assessed as having moderate to high significance in relation to complexity and PAD, they have low value in relation to the other assessment criteria. These sites and area of PAD are assessed as having moderate archaeological significance as a whole.

6.2.2.4 Lot 218 Proposal Area

The Lot 218 proposal area (including the proposed access track) comprises a landscape context that is of value in demonstrating the landscape history and dynamic nature of Stockton Bight. Within this context, archaeological material is constantly being buried, exposed, deflated and sometimes reburied thus providing windows of visibility into previous periods of the formation of the Outer Barrier. The active transgressive dune field is an integral component of the Stockton Bight landscape however, this landscape context remains preserved within the Worimi Conservation Lands. Thus, the Lot 218 proposal area is assessed as having low to moderate archaeological significance within a broader landscape context.

6.2.2.5 Lot 220 Proposal Area

The Lot 220 proposal area contains evidence of the two major periods of stabilisation in the formation of Stockton Bight and therefore represents a significant geomorphic context. Furthermore, the Lot 220 proposal area has not been subject to major disturbance as a result of historical land use and contains vegetation communities and associated resources very similar to those that would have been present during periods associated with the deposition of archaeological materials. The Lot 220 proposal area therefore provides a cultural landscape within which the landscape history, flora and fauna and archaeological material associated with this portion of Stockton Bight can be experienced as a whole. However, the same values are present within the same landscape context in the Worimi Conservation Lands and will be subject to conservation in perpetuity. The Lot 220 proposal area is therefore assessed as having moderate to high significance as a landscape.

7.0 Impacts in Relation to the Archaeological Assessment

The intention of the proposed works within the Lot 218 proposal area is to extract wind-blown sand that has been deposited in the last 50 years. However, the process of transgressive dune formation dictates that, in attempting to extract the recent sand deposits and construct a necessary access road, Mackas Sand may impact upon former stabilised soil surfaces, which have a likelihood of containing archaeological materials. As these soil surfaces are distributed discontinuously at varying depths across the transgressive dune field, it is not possible to accurately identify where the proposed operations may intersect these more sensitive areas.

In contrast, the entirety of Lot 220 is comprised of stabilised soils. However, impacts to the area of PAD within the central section of Lot 220 will be minimal, consisting only of the construction of two vehicle access tracks across the narrowest sections of the PAD area. The major impacts associated with the proposal will occur in the elevated dunes and associated slopes that have been assessed as unlikely to contain PAD, although they may contain archaeological material at low densities, such as at MFMS 1. In terms of its impacts on the landscape as a whole, within Lot 220 the proposal will result in the removal of native vegetation and within both Lot 220 and the Lot 218 proposal area, will cause the destruction of integral components of the cultural landscape. However, as discussed above, this cultural landscape will remain conserved in perpetuity within the adjoining Worimi Conservation Lands.

8.0 Management and Mitigation Recommendations

The following recommendations have been developed in light of the archaeological context of the region; the findings of the survey; the results of consultation with Aboriginal stakeholders; the potential impacts of the proposed development; current cultural heritage legislation; and the presence of a large conservation area in the vicinity of the proposal areas. The aim of the recommendations is to establish management strategies that recognise the Aboriginal cultural heritage and archaeological significance of the proposal areas and any archaeological material they may contain. Recommendations are provided in relation to the proposal as a whole and for each of the proposal areas.

8.1 General Recommendations

The proposal involves activities that will occur over a lengthy period of time, with sections of the proposal areas not subject to immediate impact. It is therefore advantageous to develop a document that clearly defines the process by which Aboriginal cultural heritage within the proposal areas will be managed over the lifetime of the operations. It is therefore recommended that:

- an Aboriginal cultural heritage management plan (ACHMP) should be developed for the proposal areas prior to the commencement of the proposed activities. The ACHMP will be developed in consultation with the relevant Aboriginal stakeholders and DECC. The matters that will be addressed in the ACHMP include (but are not limited to):
 - the establishment of a management group to manage matters relating to Aboriginal cultural heritage within the proposal area;
 - protocols for the monitoring of operations in the Lot 218 proposal area (refer to **Section 8.2**);
 - protocols for the monitoring of vegetation removal within the Lot 220 proposal area (refer to **Section 8.3**);
 - suitable procedures should additional archaeological material be exposed during the course of operations; and
 - the provision of recommendations for the management of portions of the proposal areas not subject to initial impact.

The specific recommendations for each of the proposal areas incorporate mitigation strategies to identify and salvage archaeological materials that may be present in a sub-surface context. However, it is not possible to develop a system of testing and sub-surface salvage that provides absolute surety that all sub-surface deposits will be identified. Consequently, it is recommended:

- the ACHMP should incorporate a mechanism for the management of unexpected sub-surface deposits whereby, should operations result in the exposure of compact shell midden or suspected hearth or heat treatment features, works should cease in the immediate vicinity of the material. An archaeologist and the relevant Aboriginal stakeholders should be contacted and an appropriate mitigation strategy should be developed.

Furthermore, it is likely that the mitigation strategies will result in the salvage of archaeological material, namely stone artefacts and shell. The mitigation strategies have been developed to assist in increasing our knowledge of how Aboriginal people used this

area. The analysis and interpretation of the results of the mitigation activities is an integral component of this process. It is therefore recommended that:

- the salvaged stone artefacts should be subject to detailed analysis in accordance with the methodology provided in **Attachment 2**. Shell will be identified to species (where possible) and weighed; and
- following completion of each major stage of mitigation activities, a report will be compiled that presents the findings of the activities. Reports will be completed in accordance with DECC guidelines and requirements and will include:
 - a description of the results of the activities including general environmental information, landscape information, soil descriptions and excavation profiles (where applicable);
 - the results of detailed artefact recording and analysis of salvaged archaeological material; and
 - the use of recovered data (artefact analysis and environmental information) to address the research questions identified in **Attachment 3**.

Human skeletal material has been found within the active transgressive dune field on Stockton Bight and it is not possible to rule out the possibility that human skeletal material may be present in the proposal areas. Human skeletal material is generally of very high archaeological significance and is of particular significance to Aboriginal people. As it is not possible to predict the location, condition or nature of human skeletal area that may be present within the proposal areas, it is not possible at this stage to provide detailed management strategies. The following recommendations are therefore provided to give certainty that if human/possible human skeletal material is found, it will be managed in accordance with legal requirements, the wishes of the relevant Aboriginal stakeholders and DECC requirements. Should human/possible human skeletal material (single bones or an intact burial) be located within any excavated area, it will be managed in accordance with the following strategy:

- Excavation works within the immediate vicinity of the skeletal material will cease and the area will be cordoned off for 10 metres from all edges of the skeletal material.
- The skeletal material will be inspected to determine whether it is human or animal. If necessary, advice will be sought from a forensic specialist.
- If the skeletal material is human, the DECC and NSW Police will be contacted. No further works will proceed until an appropriate course of action has been determined in consultation with DECC, NSW Police and the Aboriginal stakeholders.
- If the skeletal material is not human, mitigation activities or works can proceed in accordance with the recommendations provided in **Sections 8.2 and 8.3**.

8.2 Lot 218 Proposal Area

The Lot 218 proposal area (including the proposed access track in Lot 227) is comprised primarily of wind-blown sand that has been deposited within the last 50 years and therefore will not contain archaeological materials in their original depositional context. However, former stabilised soil surfaces that are typically associated with archaeological materials are likely to be present beneath the wind-blown sands in a discontinuous and unpredictable distribution. Thus, within the Lot 218 proposal area, the proposal has been designed to minimise impacts to Aboriginal cultural heritage by avoiding disturbance of former stabilised

soil surfaces, where possible. Due to operational requirements, it may be necessary to disturb stabilised soil profiles in some area. This is best described as a 'minimal impact' approach in relation to Aboriginal cultural heritage. As discussed in **Section 6.2.2.4**, large sections of the same landform context (with presumably the same Aboriginal heritage values) are conserved within the Worimi Conservation Lands and therefore a formal conservation outcome is not justifiable for the Lot 218 proposal area. However, the management and mitigation strategy outlined below will provide an informal conservation outcome (for the majority of stabilised soil surfaces where impacts can be avoided) whilst also providing a means for salvage (involving surface collection and/or sub-surface salvage) of archaeological material subject to impacts and allowing for the on-going monitoring of operations.

The following recommendations outline the operational process and provide specific mitigation requirements should impacts be necessary.

- Within the extraction area, an initial 'first workings' path of approximately 12 metres in width at the base will be developed for each section of operations within which earth-moving equipment will be utilised to remove wind-blown sand until a former stabilised soil surface is exposed OR a suitable working depth is reached (whichever comes first).
- During the construction of the proposed access road in Lot 227, the procedure outlined above will also be followed.
- If a stabilised soil surface is exposed within either the first workings path or the access road, an archaeologist will be contacted to record its location in three dimensions (easting, northing and elevation) with a hand-held GPS and appropriate management strategies will be determined (as described below).
- Once the stabilised soil surface or suitable working depth is reached, a sand buffer of at least 50 centimetres in thickness will be created above the surface and, if it is an area to be trafficked by road-going vehicles, an additional layer of soil topped by roadbase will be laid down to provide a working surface and a buffer above the stabilised soil surface (if present).
- Subsequent sand extraction will then proceed from the first workings path at approximately the same depth.
- Should a stabilised soil surface be exposed at any time during extraction, works will cease at that depth and if possible, extraction will only occur to within fifty centimetres of the stabilised soil surface.
- Should it be necessary to undertake disturbance to a stabilised soil surface, the relevant Aboriginal stakeholders and an archaeologist will be contacted and the soil surface will be assessed to determine whether it constitutes a PAD under the definition provided in **Section 5.2.3**. This allows flexibility throughout the life of the proposal because as works proceed and a greater understanding of archaeological expectations within Lot 218 is obtained, it is likely that the identification of PADs will be more refined and mitigation strategies will therefore be more targeted. If it is not considered a PAD, works may proceed following the collection of any surface archaeological material in accordance with the methodology provided in **Attachment 3**. If the soil surface is identified as a PAD, surface collection and test excavation of the stabilised soil surface (within the area to be impacted) will be conducted in accordance with the research design and methodology outlined in **Attachment 3**.

- Should test excavations identify any of the following, salvage excavations will be conducted in accordance with the research design and methodology outlined in **Attachment 3**:
 - consolidated shell midden deposits (comprising packed shell as opposed to dispersed shell fragments);
 - stone artefact scatters that contain high densities of artefacts (greater than three artefacts per test pit, or as otherwise agreed by the relevant stakeholders and an archaeologist) and/or an artefact assemblage of notable complexity or research value; and/or
 - hearth or heat treatment feature.
- A sample of reject material from the coarse screen will be bagged each day (where sufficient reject material is present). The bagged samples will be provided on-site to the Management Group (as will be developed under the ACHMP) monthly for inspection. Should the samples contain shell material or stone artefacts, the Management Group will contact an archaeologist to further record and assess these materials.

A monitoring visit to the Lot 218 proposal area will be conducted by the Management Group on a monthly basis for the first 12 months of operation, with subsequent inspection intervals to be determined as part of the ACHMP.

8.3 Lot 220 Proposal Area

Within the Lot 220 area, operations cannot be undertaken without impacting stabilised soil surfaces and the associated archaeological material (if present). The area adjoins a large National Park, which contains the same geomorphic units and landforms within a comparable environmental context. It is therefore highly likely that the archaeological material present within the Lot 220 proposal area is similar in nature and extent to that being conserved within the existing National Park. A conservation outcome is therefore not considered justified. However, as discussed in **Section 5.2.3.2**, the Lot 220 proposal area contains considerable areas of PAD that are likely to have very high research value and therefore it is not archaeologically justifiable to recommend the destruction of this area without undertaking mitigating activities involving salvage of archaeological materials (including surface collection and potentially sub-surface salvage). These mitigating activities will apply to both the known sites (MSFM1 and MSFM2) and also the area of PAD identified through the centre of the Lot 220 proposal area, although only minor impacts are proposed for this area. It is also essential that a mechanism be provided for monitoring operations throughout the life of the proposal.

Specific recommendations for the Lot 220 proposal area are provided below.

- Prior to removal of any vegetation, all on-site staff will be made aware of the diagnostic features of Aboriginal scarred trees (as will be defined in the ACHMP) and advised that should any possible Aboriginal scarred trees be identified during vegetation clearance, all clearance in the immediate vicinity of the possible scarred tree should cease until it can be inspected by an archaeologist and the relevant Aboriginal stakeholders.
- During undergrowth clearance activities in each area selected for impact, the relevant Aboriginal stakeholders will be provided with the opportunity to inspect the area following the removal of vegetation. During the inspection, the stakeholders may collect surface archaeological materials (such as stone artefacts and shell) in accordance with the research design and methodology provided in **Attachment 3**.

- Should the stakeholders identify any of the following during the inspection, test excavations will be conducted in accordance with the research design and methodology provided in **Attachment 3**:
 - high densities of stone artefacts, shell or bone fragments (as assessed by an archaeologist and the relevant Aboriginal stakeholders).
- Should test excavations identify any of the following, salvage excavations will be conducted in accordance with the research design and methodology outlined in **Attachment 3**:
 - consolidated shell midden deposits (comprising packed shell as opposed to dispersed shell fragments);
 - stone artefact scatters that contain high densities of artefacts (greater than three artefacts per test pit, or as otherwise agreed by the relevant stakeholders and an archaeologist) and/or an artefact assemblage of notable complexity or research value; and/or
 - hearth or heat treatment feature.
- Impacts to the area of PAD identified in **Figure 5.5** will be avoided with the exception of three access roads, the location of which will be determined in consultation with the relevant Aboriginal stakeholders and an archaeologist. The area shown in **Figure 5.5** will be clearly demarcated to prevent unintentional impacts during operations. If the construction of the access roads or any other activities within the demarcated area will result in impacts to the low dune ridge landforms identified as PAD, these impacts will be assessed and appropriate mitigation measures developed as part of the ACHMP.
- A sample of reject material from the coarse screen will be bagged each day as required. The bagged samples will be provided to Management Group monthly for an on-site inspection (as part of the monthly monitoring visit and reject material inspection carried out for Lot 218). Should the samples contain shell material or stone artefacts, the Management Group (as will be developed under the ACHMP) will contact an archaeologist to further record and assess these materials.

A monitoring visit to the Lot 220 proposal area will be conducted by the Management Group on a biannual basis for 12 months, with subsequent inspection intervals to be determined as part of the ACHMP.

9.0 Care and Control of Archaeological Material

It is proposed that at the completion of each major stage of mitigation activities the archaeological material is returned initially to a suitably qualified and experienced archaeologist, for recording and analysis. Following analysis the artefacts should be temporarily placed in the care and control of the Worimi LALC until such time as an appropriate location for reburial of the archaeological material can be determined by the Management Group and an archaeologist, with a site card to be submitted to DECC following reburial of the archaeological material. A draft of this report in which it was suggested that an area within Lot 220 that will not be subject to impact would be a suitable location for reburial of the archaeological material was provided to the relevant Aboriginal stakeholders on 15 August 2008 and it was requested that the Aboriginal stakeholders provided comment on this suggestion. Nur-Run-Gee provided endorsement for this proposed care arrangement whilst Mur-Roo-Ma, Worimi LALC and Worimi Traditional Aboriginal Elders and Owners Group provided general agreement with the recommendations of the draft report.

10.0 References

- Australian ICOMOS Incorporated 2000. The Burra Charter: the ICOMOS charter for conservation of places of cultural significance with associated guidelines and code on the ethics of coexistence. Australian ICOMOS, Canberra.
- Butlin, N 1982. Close encounters of the worst kind: modelling Aboriginal depopulation and resource competition 1788-1850. Australian National University, Canberra.
- Dean-Jones, P 1990. Newcastle Bight Aboriginal Sites Study. Report to NSW National Parks and Wildlife Service and National Estate Grants Committee.
- Dean-Jones, P 1992. Archaeological survey at Fern Bay. Report to Port Stephens Council.
- Elkin, A P 1932. Notes on the social organisation of the Worimi, a Kattang-speaking people. Oceania 2:359-363.
- Enright, W J 1932. The Kattang (Kutthung) or Worimi: An Aboriginal Tribe. Mankind:75-77.
- Environmental Resources Management (Australia) Pty Ltd (ERM). 2001. Interim final report on excavations, Fern Bay Archaeological Project 2000. Report to NSW NPWS.
- Environmental Resources Management (Australia) Pty Ltd (ERM). 2003. Electricity Supply Upgrade from Tomago to Tomaree Environmental Impact Statement. Annex D Indigenous Cultural Heritage Assessment. Report to EnergyAustralia.
- Environmental Resources Management (Australia) Pty Ltd (ERM) 2006. Stockton Bight Remaining Lands Cultural Heritage Significance Assessment. New South Wales National Parks and Wildlife Service, Nelson Bay.
- Koettig, M. 1987. Preliminary assessment of Aboriginal archaeological sites in the proposed sand extraction area at Nelson Bay Road, Newcastle Bight DP5300. Report to NSW National Parks and Wildlife.
- McCardle Cultural Heritage (MCH) 2004. Proposed Sewerage Pipeline at Fern Bay Indigenous Cultural Heritage Assessment. Unpublished report to Hunter Water Australia.
- McCardle Cultural Heritage (MCH) 2005a. Proposed Sewerage System at Fern Bay Stage One Test Excavations. Unpublished report to Hunter Water Australia.
- McCardle Cultural Heritage (MCH) 2005b. Proposed Sewerage System at Fern Bay Stage Two Test Excavations. Unpublished report to Hunter Water Australia.
- National Parks and Wildlife Service (NSW NPWS) 1997. Aboriginal Cultural Heritage: Standards and Guidelines Kit. NPWS, Hurstville.
- Pearson, M and Sullivan, S 1995. Looking after heritage places: the basics of heritage planning for managers, landowners and administrators. Melbourne University Press, Melbourne.
- Sloss, C R, C V Murray-Wallace, B G Jones 2007. Holocene sea-level change on the southeast coast of Australia: a review. In The Holocene, 17(7): 999-1014.

- Speight, J G 1990. Landform. In R.C. McDonald, R.F. Isbell, J.G. Speight, J. Walker (eds.). Australian Soil and Land Survey Field Handbook. Department of Primary Industries, Canberra.
- Thom B G, Stephens M, Ly C K, Roy P S, Bowman G M and Hesp P A 1992. Coastal Geomorphology and Quaternary Geology of the Port Stephens-Myall Lakes Area. Australian National University, Canberra.
- Tindale, N B 1974. Aboriginal Tribes of Australia. Australian National University, Canberra.
- Umwelt (Australia) Pty Limited (Umwelt) 2000. Archaeological Assessment of a Proposed Mineral Sand Mine at Stockton Bight. Report to Mineral Deposits (Operations) Pty Ltd.
- Umwelt (Australia) Pty Limited (Umwelt) 2004a. Archaeological and Aboriginal Cultural Heritage Survey and Assessment of Lot 220 in DP 1049608, Stockton Bight. Report to Worimi Local Aboriginal Land Council.
- Umwelt (Australia) Pty Limited (Umwelt) 2004b. Archaeological and Aboriginal Cultural Heritage Survey and Assessment of Part Lot 218 DP 1044608 and WR 52573, Stockton Bight. Report to Worimi Local Aboriginal Land Council.
- Umwelt (Australia) Pty Limited (Umwelt) 2008. Ecological Assessment of Proposed Sand Extraction Project Lots 218 and 220, Salt Ash. Unpublished report to Mackas Sand.
- Worimi Local Aboriginal Land Council (Worimi LALC) 2003. Cultural Assessment: Worimi Aboriginal Owned Land at Salt Ash as for the Proposal Offered by Macca's Sand. Report to Worimi Local Aboriginal Land Council.

ATTACHMENT 1

Aboriginal Stakeholder Consultation

Attachment 1 - Aboriginal Stakeholder Consultation

Date	Type of Consultation	Authorities/Stakeholder Groups Contacted	Outcome
18/06/08	Advertisement providing notification of assessment and opportunity to registration interest in on-going consultation by no later than 16/05/08.	Advertisement placed in Newcastle Herald and Koori Mail.	
11/06/08	Letter providing notification of assessment and request to identify Aboriginal stakeholders by no later than 02/07/08.	<p>Department of Environment and Climate Change</p> <p>Office of the Registrar of Aboriginal Owners</p> <p>Port Stephens Shire Council</p> <p>NSW Native Title Services</p> <p>Worimi Local Aboriginal Land Council</p>	<p>Response received 23/05/08 providing a list of Aboriginal parties.</p> <p>Response received 22/05/08 stating that the subject land does not have Registered Aboriginal Owners.</p>
11/06/08	Letter providing notification of assessment, invitation to register interest in on-going consultation and proposed survey methodology. Written response requested by no later than 03/07/08.	<p>Nur-Run-gee Pty Ltd</p> <p>Mur-Roo-Ma Incorporated</p> <p>Maaiangal Aboriginal Heritage Corporation</p> <p>Worimi Traditional Aboriginal Elders and Owners Group</p> <p>Worimi Local Aboriginal Land Council</p>	<p>Registration of interest received 23/06/08. Leanne Anderson provided endorsement of proposed survey methodology during a telephone conversation on 20/06/08.</p> <p>Registration of interest and endorsement of survey methodology received 16/06/08.</p> <p>Registration of interest received during a telephone conversation with Carol Ridgeway-Bissett on 23/06/08. Carol indicated that, due to lack of insurance coverage, she would not be participating in the survey but will remain a registered stakeholder for consultation purposes.</p> <p>Registration of interest and endorsement of survey methodology received 25/06/08.</p> <p>Registration of interest received 02/07/08.</p>

Date	Type of Consultation	Authorities/Stakeholder Groups Contacted	Outcome
7/07/08-11/07/08	Telephone calls and emails to organise survey of the project area.	Nur-Run-Gee Pty Ltd Mur-Roo-Ma Incorporated Worimi Traditional Aboriginal Elders and Owners Group Worimi Local Aboriginal Land Council	Proposed survey date suitable. Proposed survey date suitable. Les Ridgeway indicated that he did not wish to participate in the survey but would like to receive a copy of the draft assessment report and be included in on-going consultation regarding the assessment. Proposed survey date suitable.
14/07/08	Survey of part Lot 218.	Nur-Run-Gee Pty Ltd Mur-Roo-Ma Incorporated Worimi Local Aboriginal Land Council	Nur-Run-Gee representative (Leanne Anderson) indicated that she was happy with the way in which the survey had been conducted. Mur-Roo-Ma representative (Anthony Anderson) indicated that he was happy with the way in which the survey had been conducted. Worimi Local Aboriginal Land Council representative (Jamie Merrick) indicated that he was happy with the way in which the survey had been conducted.
18/07/08	Survey of Lot 220.	Nur-Run-Gee Pty Ltd Mur-Roo-Ma Incorporated Worimi Local Aboriginal Land Council	Nur-Run-Gee representative (Leanne Anderson) indicated that she was happy with the way in which the survey had been conducted. Mur-Roo-Ma representative (Anthony Anderson) indicated that he was happy with the way in which the survey had been conducted. Worimi Local Aboriginal Land Council representative (Jamie Merrick) indicated that he was happy with the way in which the survey had been conducted.
15/08/08	Draft assessment report provided to Aboriginal stakeholders for comment.	Nur-Run-gee Pty Ltd Mur-Roo-Ma Incorporated Maaiangal Aboriginal Heritage Corporation	Comments received and addressed in report. Written comments included in Attachment 1 . Comments received and addressed in report. Written comments included in Attachment 1 . Comments received and addressed in report.

Date	Type of Consultation	Authorities/Stakeholder Groups Contacted	Outcome
		Worimi Traditional Aboriginal Elders and Owners Group	Comments received and addressed in report.
		Worimi Local Aboriginal Land Council	Comments received and addressed in report. Written comments included in Attachment 1 .
28/11/08	Letter informing stakeholders of modification of the proposal to include an access road on Lot 227.	Nur-Run-gee Pty Ltd Mur-Roo-Ma Incorporated Maaiangal Aboriginal Heritage Corporation Worimi Traditional Aboriginal Elders and Owners Group Worimi Local Aboriginal Land Council	Comments received and addressed in report. Written comments provided in Attachment 1 .
1/12/08	Steven Crick (Environmental Scientist, Umwelt) attended a WLALC member meeting at Williamstown to discuss construction of the proposed access road on Lot 227.	Worimi Local Aboriginal Land Council	Correspondence dated 3 December 2008 received from Andrew Smith, on behalf of the WLALC stated that the members of the WLALC approve of the proposed access road, on the basis that a number of conditions apply (refer to Attachment 1). Approval must also be obtained from the New South Wales Aboriginal Land Council (NSWALC) and it was requested that Mackas Sand obtain the services of an independent legal council to assist with this process. In this correspondence it was also requested that the volume of sand requiring to be moved in order to construct the access road be calculated and this information provided to the WLALC as soon as possible.

Budsoar Pty Ltd ACN 053 994 915
Trading As KOORI MAIL
PO Box 117 LISMORE NSW 2480
Ph (02) 66 222 666 Fax (02) 66 222 600
ABN 19 053 994 915

TAX INVOICE

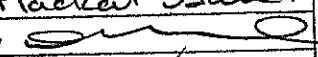
DATE 18/06/2008 INVOICE NO 22511

INVOICE TO

UMWELT AUSTRALIA PTY LTD
PO BOX 838
TORONTO NSW 2283

TERMS DUE DATE
Net 30 18/07/2008

RATE	DESCRIPTION	QTY (CM)	GST AMT	AMOUNT
6.50	PROPOSED SAND EXTRACTION PROJECT SALT ASH STOCKTON BIGHT NSW AD BOOKED AND APPROVED BY DANA 5 X 2 CM ORDER NO. 383525	10	16.50	181.50

Invoice Authorisation	
Job No 1646	Task No
Description Macken Sand.	
Authorised By 	
Date 14.7.08	

SUBTOTAL 165.00

GST TOTAL 16.50

Total inclusive of GST \$181.50

FAIRFAX MEDIA PUBLICATIONS PTY LIMITED
A.B.N. 33 003 357 720



UMWELT SERVICES PTY LTD
2/20 THE BOULEVARDE
TORONTO NSW 2283

RECEIVED

26 JUN 2008

Statement Date

22 Jun 2008

Account Number

001043501

Date Due

29 Jun 2008

Previous Balance

\$387.49

Payments

\$(387.49)

Adjustments

\$0.00

Current Charges

\$206.62

AMOUNT DUE

\$206.62

See over for details

Page 1 of 2

Summary of Current Advertising Charges - Payment Terms Net 7 Days

Contact Numbers

To Place Your Classified Advertising

Sydney Morning Herald

13 25 35

Newcastle Newspapers

13 16 96

Fairfax Community

Newspapers

13 24 25

Illawarra Mercury

Newspapers

1300 304 255

Customer Service

Classified Advertising

1300 858 970

Display Advertising

1300 858 980

Internet Advertising

1300 731 243

Account Queries

1300 858 990

Edition

EXAMINER CD FULL RUN

Size

16 CMS

Amount

\$206.62

Invoice Authorisation	
Job No	1646
Task No	
Description	Maekas Sand Extraction
Authorised By	[Signature]
Date	27.6.08

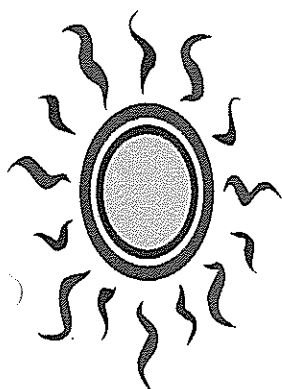
PAID
27 JUN 2008



ENTER

THE LARGEST DAILY CLASSIFIED MARKETPLACE IN
NEWCASTLE, LAKE MACQUARIE AND THE HUNTER
PHONE 13 16 96

Nur-Run-Gee Pty Ltd
ABN 37 096 307 701



**CULTURAL AND HERITAGE
CONSULTANT
LICENCED BUILDER**

22 Popplewell Road
Fern Bay 2295

Phone: 02 49 201578
Mobile: 0408 618 874 Leanne
Mobile: 0431 334 365 Lennie
Email:
goodman@kooee.com.au

19th August 2008

Umwelt Australia Pty Ltd
Attention Nicola Roche
PO Box 838
Toronto NSW 2283

**Re; Draft Aboriginal Cultural Heritage Assessment of Part Lot 218
in DP 1044608 and Lot 220 in DP 1049608 Salt Ash**

Dear Nicola

Thank you for the opportunity to comment on the draft report for the
Aboriginal Cultural Heritage Assessment of Part Lot 218 in DP
1044608 and Lot 220 in DP 1049608 Salt Ash

After reading the draft report, Nur-Run-Gee P/L understands the
recommendations and agreements that Umwelt Australia Pty Ltd have
stated in the report and find that they are acceptable.

Nur-Run-Gee Pty Ltd wish it to be noted that we have found that this
report to be well written and informative as well as concise and as
accurate as possible.

As discussed in 8.1 General Recommendations, our company looks
forward to discussing the Aboriginal Cultural Heritage Management
Plan.

In regard to 8.2, Lot 218 Proposal Area, and 8.3 Lot 220 Proposal
Area, we find the management recommendations for both lots to be
acceptable.

Nur-Run-Gee P/L agrees with the report where stated in section 9.0
Care and Control of Archaeological Material. We find it acceptable that
any archaeological material found is recorded and analysis is
undertaken and then to be temporarily placed in WLALC care until a
suitable location is found within Lot 220 that is acceptable to all parties
involved.

Please do not hesitate to contact us if further information is required.

Yours Sincerely

Leanne Anderson
Directors
Nur-Run-Gee Pty Ltd

Nicola Roche

From: Anthony Anderson [murroomainc1@hotmail.com]
Sent: 20 August 2008 12:50
To: Nicola Roche
Subject: Draft Report For lot 218 DP 1044608 and lot 220 in DP 1049608 Salt Ash

Hi Nic

What a great report it's one of the best i have read for a while it has respected our beliefs and cultural wishes.

All land is significant to our people the proposed area is part the Stockton Bight which our people lived and travelled along this is indicated by the high number recorded sites in the area We strongly support the establishment of a management system and the ongoing additional archaeological investigations.

Mur-roo-ma Inc fully understands and agrees with the methodology and recomendations you have put forward in this draft report.

Anthony J Anderson
CEO Mur-roo-ma Inc

Find out: SEEK Salary Centre [Are you paid what you're worth?](#)

21/08/2008



WORIMI LOCAL ABORIGINAL LAND COUNCIL

ABN 51 352 201 603

Our Ref: AS/1.20.3.10_CHA 218 220 Salt Ash

2163 Nelson Bay Rd
Williamstown NSW 231829th August 2008Nicola Roche
Senior Archaeologist
Umwelt Environmental Consultants
PO Box 838
2/20 the Boulevard
TORONTO NSW 2283PO Box 56
Tanilba Bay NSW 2319Phone: 02 4965 1500
Fax: 02 4965 1799

Wangi Bii Nicola,

Re: Draft Aboriginal Cultural Heritage Assessment Part Lot 218 DP 1044608 & Lot 220 DP 1049608, Salt Ash – August 2008 (ACHA – Salt Ash)

info@worimi.org.au

Thank you for consulting with the Worimi Local Aboriginal Land Council (WLALC) in relation to the above noted assessment.

We have been extremely pleased with the level of consultation undertaken for this project and welcome the onsite (walking the land) survey's that have occurred. We note the detail that has been recorded as part of your assessment and commend you on comprehensive information contained within the Draft Cultural Heritage Assessment supplied.

We confirm that our response in relation to the ongoing consultation, management and mitigation strategies, has taken into consideration the following:

- The Aboriginal Land Rights Act 1983 (as amended)
 - Part 5 Division 1, 52 Functions of Local Aboriginal Land Council:
 - (k) To protect the interest of Aboriginal person in its area in relation to the acquisition, management, use, control and disposal of its land,
 - (m) To promote the protection of Aboriginal culture and the heritage of Aboriginal person in its area
- Worimi Traditional Owner knowledge
- Site Surveys conducted by WLALC Ranger Mr Jamie Merrick on both 14th & 18th July 2008
- DRAFT Aboriginal CHA Assessment - August 2008
- Material, Spiritual & Natural Landscape Significance

ACHA –Salt Ash / Section 8.1 General Recommendations

It is understood and accepted that the duration of works over Lots 218 & 220 (sand extraction) is long-term and therefore, the Worimi LALC accept and welcome an Aboriginal Cultural Heritage Management Plan (ACHMP) being developed to assist with the mitigation and management strategies needed for this project.

Additionally, the Worimi LALC supports the recommendations listed as **8.1 General Recommendations** and appreciate that refinement of these recommendations will be realised in the development of the ACHMP. In doing so, the WLALC requests the following minor amendments be implemented:

• **The establishment of a management group to manage matters relating to Aboriginal cultural heritage within the proposal areas;**

1. It is our understanding and request that the 'management group' will have a continuing role, (following the completion of the ACHMP) **as an advisory group**, supporting the proponent in their commitment and implementation of the ACHMP with the additional role of supplying preliminary cultural awareness training and monthly site inspections.
2. The WLALC request the development of a 'heads of agreement' and its incorporation into the ACHMP, designed to characterise the 'separation of power' and 'delegation of authority' over the sand extraction operations that, if not clearly documented, could otherwise mistakenly perceive the 'management group' as 'Governing Body' (i.e. policy & procedures / roles & responsibilities).
3. The WLALC requests that the proponent be intimately involved in the development of the ACHMP to ensure awareness of content and the achievement of ownership by the proponent in relation to the preservation of Aboriginal Culture & Heritage throughout the two sites.

• **Protocols for monitoring of vegetation removal within the Lot 218 proposal area (refer to Section 8.2);**

1. The WLALC agrees with the protocols for monitoring of operations of Lot 218 as outlined in dot point form under Section 8.2, with the following amendment.

Amendment: ***The WLALC requests that the final dot point and paragraph of Section 8.2 be amalgamated to read as follows:***

- A monitoring visit to Lot 218 proposal area will be conducted by the Management Group on a monthly basis for the first 12 months of operation, **during which** a bag of rejected samples from the coarse screen (collected daily where sufficient reject material is present) will be made available to the Management Group for their inspection. Should it be determined that the rejected materials contain items of cultural significance, the Management Group will contact an archaeologist and DECC to further assess and record these materials.
- *Subsequent inspection intervals will be determined as part of the ACHMP*

Reasoning: Given this recommendation requires the proponent to bag rejected materials on a daily basis, the costs involved i.e. wages & fuel etc, and the thought of hauling (potentially) up to 30 bags (& to where) is a logistical nightmare. Not to mention the rehousing of materials once assessed. A simple wording change allows for haulage issues to be eliminated, the monitoring to be implemented and appropriate rehousing of the materials to be achieved.

• **Protocols for monitoring of vegetation removal within the Lot 220 proposal area (refer to Section 8.3);**

1. The WLALC agrees with the protocols for monitoring of operations of Lot 220 as outlined in dot point form under Section 8.3, with the following minor amendment to the last dot point.
- A sample of reject material from the coarse screen will be bagged each day as required. The bagged samples will be provided for monthly inspection **onsite at Lot 220** to the Management Group. Should the samples contain shell material or stone artefacts, the Management Group will contact an archaeologist and DECC to further assess and record these materials.


In closing, the WLALC supports both the content and intent of:

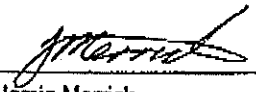
- Artefact Recording and Analysis (**Appendix 2**)
- Research design and methodology (**Appendix 3**)

of the Draft Aboriginal Cultural Heritage Assessment Part Lot 218 DP 1044608 & Lot 220 DP 1049608, Salt Ash – August 2008.

Should you require any further information please do not hesitate to contact our office on the numbers listed above.

Yilga


 Andrew Smith
 Chief Executive Officer
 Worimi Local Aboriginal Land Council


 Jamie Merrick
 Snr Field Officer / Worimi Traditional Owner
 Worimi Local Aboriginal Land Council

Our Ref: 1646/PJ/SC/NR/281108

28 November 2008

«Company_Name»
Attention: «Title» «First_Name» «Last_Name»
«Address_Line_1»
«Address_Line_2»
«City» «State» «ZIP_Code»

Dear «First_Name»

Re: Additional Proposed Access Road on Lot 227 to Adjoin Lot 218 Proposal Area, Mackas Sand

As you are aware, Umwelt (Australia) Pty Limited (Umwelt) has recently completed an Aboriginal Cultural Heritage Assessment of Part Lot 218 in DP 1044608 and Lot 220 in DP 1049608, Salt Ash in consultation with your group. Following the completion of the draft report and the incorporation of your comments on that report, Mackas Sand has advised that they wish to introduce a minor change to the proposal in relation to Lot 218. This will involve the construction of a small section of access road of approximately 50 metres in length within Lot 227 (refer to **Figure 1**). This small section of unformed access road will link the Lot 218 operations to an existing access road to allow for the extracted sand to be removed from site.

The area within Lot 227 that is proposed for impact by the access road is covered by windblown sands. As discussed in the report, the inspection of these windblown sands has no archaeological merit as the sand was deposited in approximately the last 50 years. However, as with the rest of the Lot 218, it is possible that intact soil surfaces that may contain Aboriginal archaeological material may be present below these windblown sands. It is therefore recommended that the same management strategy be applied to the small section of access road within Lot 227 as to the development of the first workings path within Lot 218. This strategy is provided below.

- Earth-moving equipment will be utilised to remove wind-blown sand until a former stabilised soil surface is exposed OR a suitable working depth is reached (whichever comes first).
- If a stabilised soil surface is exposed, an archaeologist will be contacted to record its location in three dimensions (easting, northing and elevation) with a hand-held GPS and appropriate management strategies will be determined (as described below).
- Once the stabilised soil surface or suitable working depth is reached, a sand buffer of at least 50 centimetres in thickness will be created above the surface and, if it is an area to be trafficked by road-going vehicles, an additional layer of soil topped by roadbase will be laid down to provide a working surface and a buffer above the stabilised soil surface (if present).
- Should it be necessary to undertake disturbance to a stabilised soil surface, the relevant Aboriginal stakeholders and an archaeologist will be contacted and the soil surface will be assessed to determine whether it constitutes a PAD under the definition provided in **Section 5.2.3** of the report. This allows flexibility throughout the life of the proposal because as works proceed and a greater understanding of archaeological expectations within Lot 218 is obtained, it is likely that the identification of PADs will be more refined and mitigation strategies will therefore be more targeted. If it is not considered a PAD, works may proceed following the collection of any surface archaeological material in accordance with the methodology provided in **Appendix 3** of the report. If the soil surface is identified as a PAD, surface collection and test excavation of the stabilised soil

surface (within the area to be impacted) will be conducted in accordance with the research design and methodology outlined in **Appendix 3** of the report.

As the above represents slight alterations to the draft report that was provided for your comment, it is requested that you consider these alterations and provide additional comment as to whether these alterations are considered satisfactory from a cultural perspective. In order to finalise the report for submission to the Department of Planning, it is requested that you provide comment by no later than 22 December 2008.

Should you wish to discuss this matter or require any further information, please do not hesitate to contact me on 4950 5322.

Yours faithfully

Nicola Roche
Senior Archaeologist

enc



Source: Department of Lands (2003)

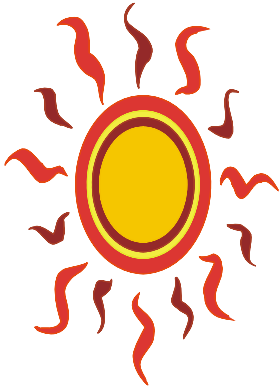
0 200 400 600m
1:12 000

Legend

- Lot Boundaries
- Proposed Operational Area
- Site Access
- Proposed Site Access

FIGURE 1
Proposed Access Road

Nur-Run-Gee Pty Ltd
ABN 37 096 307 701



**INDIGENOUS ARCHAEOLOGIST
CULTURAL AND HERITAGE
CONSULTANT
LICENCED BUILDER**

22 Popplewell Road
Fern Bay 2295

Phone: 02 49 201578
Mobile: 0408 618 874 Leanne
Mobile: 0431 334 365 Lennie
Email:
goodman@kooe.com.au

2nd December 2008

Umwelt Australia Pty Ltd
Attention Nicola Roche
PO Box 838
Toronto NSW 2283

**Re; Additional Proposed Access Road on Lot 227 to Adjoin Lot
218 Proposal Area, Mackas Sand**

Dear Nicola

Thank you for the opportunity to comment on the Additional Proposed Access Road on Lot 227 to Adjoin Lot 218 Proposal Area, Mackas Sand

Nur-Run-Gee Pty Ltd agrees with the continuation of the Cultural Management Plan that is to be adopted for Lot 218 to be utilised in this proposal.

Nur-Run-Gee Pty Ltd does not agree with the access being utilised for the extraction of sand from any other area within Lot 227 that is not directly mentioned in this correspondence as being the considered work schedules.

Additional proposed access road Lot 227 does not exceed the agreed distance of entry and the right of access only includes an entry to Lot 218.

Nur-Run-Gee Pty Ltd raises the questions;

1. Is there a current agreement between Mackas Sands and the Towers Family Group to allow access?
2. Which group is to be extracting the sand before entry is gained to Lot 227 to Adjoin Lot 218?

Nur-Run-Gee Pty Ltd wishes it to be noted that Lot 227 could be an area of concern under the Native Title Act

Please do not hesitate to contact us if further information is required.

Yours Sincerely

Lennie Anderson
Director
Nur-Run-Gee Pty Ltd



WORIMI LOCAL ABORIGINAL LAND COUNCIL

Our Ref: AS/1.20_Sand Ext/Umwelt/Access Lot 227.doc

ABN 51 352 201 603

03rd December 2008

Nicola Roche
Senior Archaeologist
Umwelt Environmental Consultants
PO Box 838
TORONTO NSW 2283

2163 Nelson Bay Rd
Williamstown NSW 2318

PO Box 56
Tanilba Bay NSW 2319

Dear Nicola,

**Re: Additional Proposed Access Road on Lot 227 to Adjoin Lot 218 Proposal Area,
Macka's Sand**

Phone: 02 4965 1500

Fax: 02 4965 1799

I write in relation to the above noted heading and the correspondence items received from your organisation on behalf of Macka's Sand.

info@worimi.org.au

We understand that Macka's Sand would like to construct a small access road, approximately 50 metres in length, across (WLALC Freehold Land) Lot 227 DP 1097995 in order to access and extract sand from Lot 218.

The proposal to allow access across Lot 227 was assessed by the WLALC Board on Tuesday 11th November 2008, at which time it was accepted that access be approved, subject to endorsement by WLALC Members at an Extra-Ordinary Meeting (specifically called for this purpose at which a quorum was present), in accordance with the Aboriginal Land Rights Act 1983 (ALRA), Section 40B Lease, use etc of land (2) (b).

I confirm that such meeting was held on Monday 1st December 08, at which time, the WLALC Members considered all options in relation to your request. Following close consideration and lengthy debate, the WLALC Members approved the access and motioned to accept the following resolution:

WLALC Members Resolution: 011208_1

The Worimi Local Aboriginal Land Council (WLALC) Members approve access across Lot 227 DP1097995 via way of land owner approval to construct an access road (i.e. easement) to Lot 218 DP1097995 for the sole purpose of extracting sand off Lot 218 DP1097995 with the following conditions:

- The base of the road is to be no wider than 10 meters (includes a 30 degree batter)
- The road is to not exceed any further than 50 meters in length
- The Culture Heritage Management Plan which applies to Lot 218 must also apply to Lot 227 (in accordance to the Draft Plan 'and' the letter received from Umwelt (dated 28 Nov 2008) (attached)

- There is very minimal impact on the remnant soil. If and when remnant soils are exposed 'ALL Works' will cease immediately and further investigations will be conducted with the participation of local Aboriginal consulting groups
- The works remain a minimum of 1 - 2 meters above ground water level (or as determined by Government regulations)
- 'ALL' road maintenance costs (both initial and ongoing) are to be incurred by Macka's Sand Pty Ltd for the lifespan of the Sand Extraction activity on Lot 218.
- An unwavering 'Legal Agreement' must be secured between Macka's Sand Pty Ltd and the Towers Family Group (witnessed by the WLALC CEO & Chairperson).
- A sound and ALRA compliant 'Legal Agreement' is reached and entered into between the WLALC and Macka's Sand Pty Ltd.

Mover & Secondor have been omitted for privacy & sensitivity

In keeping with the conditions of the ALRA, Section 40B Lease, use etc of land (2) (b), prior to any action the WLALC must first secure approval from the New South Wales Aboriginal Land Council (NSWALC), including the creation of an 88B Instrument (creating an easement) which we understand is to be registered on the WLALC Deed & Title.

In order to secure NSWALC's approval the WLALC requires independent legal counsel to assist us through the process and it is therefore requested that this expense be incurred by Macka's Sand. We would like confirmation of this agreement in writing.

Additionally, further consideration and agreement needs to be given to the surplus of sand that we envisage will be produced as a result of creating the easement, something that we also predict to be of quite significant volume? (We would like to be immediately notified of the volume once calculated).

An option may be that the Sand Extraction Agreement entered into by Macka's Sand & WLALC is amended to include the easement area 'ONLY' over Lot 227? However, this will also require the approval of WLALC Members and NSWALC before proceeding.

In lieu of all the above, I confirm the commitment of the WLALC and its Members to fully support access across Lot 227 DP 109799 and endeavor to have this matter finalized as a matter of urgency.

If you could please consider all of the above and contact us at your earliest convenience it would be greatly appreciated.

I look forward to speaking with you soon.

Yours sincerely,

Andrew Smith
Chief Executive Officer
Worimi Local Aboriginal Land Council
Encl (1)

ATTACHMENT 2

Artefact Recording and Analysis

Attachment 2

1.0 Artefact Recording and Analysis

The attributes that will be recorded for the salvaged artefacts are outlined below. A discussion follows each attribute, detailing the method of recording, potential problems with the method proposed, and the possible behavioural implications of each attribute. Not all attributes can be measured on all artefacts therefore, after a discussion of most basic common attributes, subsequent attributes are divided into sections, with subsections for categories.

1.1 Common Attributes

Artefact Class

Description: Artefact class is a primarily a technological category reflecting the mechanical processes that resulted in the physical form of the artefact at the time of recovery. Classes used include flake, broken flake, retouched flake, flaked piece, core, hammerstone, grindstone, ground-edge axe, heat-shattered fragment, and non-diagnostic fragment. Retouched flakes are further subdivided into categories that are typological in nature, namely Bondi point, backed blade, geometric microlith, elouera and flake used as a core. Definitions for all classes of retouched flake are provided below. Other typological categories include axe/blank, grindstone, hammerstone and anvil.

Retouched flake (complete or broken) – any flake or piece of a flake that can be demonstrated to have been flaked subsequent to original manufacture i.e. where negative flakes scars impinge on the ventral surface and can be clearly seen to have been initiated after the original flaking activity.

Bondi point – a backed artefact that is asymmetric in shape.

Backed blade – a backed artefact that is greater than 25 millimetres in maximum dimension, is roughly symmetric in shape and is twice as wide as it is long.

Geometric microlith – a backed artefact that is symmetric in shape and is less than 25 millimetres in maximum dimension (McCarthy 1976:45).

Elouera – a backed artefact that is greater than 25 millimetres in maximum dimension, is approximately symmetric in shape and is triangular in section. The thick margin is unifacially or bifacially backed and the chord may exhibit usewear or polish (McCarthy 1976:29).

Flake used as a core – a retouched flake with clearly discernable flake attributes in which the primary purpose of retouch appears to have been for the removal of flakes rather than the modification of the margins of the artefact.

Problems: Classing artefacts does not usually entail significant problems, other than occasional ambiguities between flaked pieces and broken flakes, and between (retouched) flakes and cores that may formerly have been flakes (see section titled '**Retouch**' for further explanation). In relation to typological classifications, ambiguity is an inherent feature of artefact typology, with the lines between different types frequently imprecise. To minimise this problem, working definitions for each class used are defined above.

Uses: This category will be used to assess differences in provisioning strategies (e.g. core provisioning vs flake provisioning), differences in site function/use (e.g. presence/absence of grindstones), and the taphonomic effects of fire on site integrity (e.g. differences in the ratio of heat-shattered fragments: other artefact classes). Furthermore, despite the problem with the use of typology discussed above, typology proceeds on the basis that at different places and at different times people manufactured artefacts with specific shapes and characteristics. As a result, the general period during which an artefact was made can be inferred if it is of a specific form. It is also not uncommon to infer that a given artefact form implies a given artefact function, and that from the shape of the artefact the activities taking place at the site can be specified, though these suggestions so far lack archaeological support. The problems with both of these uses are well documented, and any such inferences drawn will be sparing. There is, however, some potential benefit in approaches based on subsistence patterns and the organization of technology. On this basis, it may be possible to make some assertions from artefact typology as to the way subsistence may have been organized at different places through the landscape.

Raw Material

Description: A largely self-explanatory attribute, raw materials expected to be present include silcrete, indurated mudstone/tuff, quartz, crystalline tuff, quartzite, petrified wood, porcellanite and basic volcanics.

Problems: This category is usually without problems, though it is acknowledged that some disagreement exists as to the appropriate nomenclature for the material most frequently referred to as 'mudstone'. Strong arguments have been made for replacing the term with indurated rhyolitic tuff; however, as the category is nominal and not technical or geological the only criteria guiding the choice of term here are that the meaning of the term be understandable to others and that it be applied consistently. For these reasons, the term indurated mudstone will be used to make the class more easily compared with other studies and to differentiate this raw material from other tuffs from different sources (e.g. the crystalline tuff that comes from the Bowmans Creek cobble beds).

Uses: Raw material is an important attribute, which may broadly indicate the place of origin of an artefact. The dominance of one raw material or another may also be used to group or differentiate sites. Raw material is also frequently used in concert with attributes in the creation of analytic units for more in-depth inter and intra site comparisons.

Artefact Weight

Description: Artefact weight will be measured for all artefacts to one tenth of a gram.

Problems: This attribute does not entail any difficulties.

Uses: One of the most useful artefact attributes, weight is the most effective approximation of volume for a given raw material. As such it most accurately reflects the amount of stone being brought to a site. Average weight within a given artefact class is also a good indication of the amount of 'stress' that has been placed on the provisioned material. Large pieces of stone still retaining usable potential are unlikely to be discarded when people are conserving their technological resources (for example, as they move increasingly away from places where replacement material is available). Alternatively, when people are close to the raw material source, or when they are provisioning larger amounts of material to a site, the pressure on the 'exhaustion threshold' is relieved and there should be a resultant rise in the average weight of discarded artefacts.

Dimensions

Percussive Dimensions (for complete flakes and broken flakes for which orientation is discernable)

Description: Percussive dimensions measure the length of the flake in the direction of force application from the point that force was applied. In this regard it relates to the length of core face that was removed during the manufacture of the artefact. Width is oriented across the face of the flake from the mid-point of length, and thickness from the mid-point of length and width of the ventral to the corresponding point on the dorsal.

Problems: While not as arbitrary as maximum dimensions, there is some uncertainty as to what these attributes are actually measuring in terms of the flake manufacturing process.

Use: Variations in average flake dimensions, and in the distribution of flake sizes in histograms, are expected to correlate with differences in the provisioning and reduction strategies at different places. For example, the reduction of cores at a site will produce a large number of moderate to small flakes and some larger flakes. As a result the histogram of flake length will show a relatively consistent increase in number of flakes from large to small. Contrastingly, when most flakes are the result of retouching or maintenance tasks on other flakes, the majority of the flakes remaining should be very small, with comparably few large to moderate flakes. However, it may be the case that a few moderate to large flakes will be discarded at the site as they are exhausted through excessive/heavy retouch or simply thrown away prior to a reprovisioning event. In such a case, a histogram of artefact size should show a bimodality in regard to length (a small peak in the moderate range and a large peak in the small range), and an even more pronounced bimodality in regard to thickness (most retouching flakes being very thin).

Maximum Dimensions (for all other artefact types)

Description: Maximum length will be measured on all artefacts and maximum width and thickness will be measured on all artefacts with the exception of flaked pieces and heat shatter. 'Length' will arbitrarily be measured along the longest plain, with width the longest of the plains at 90° to length, and thickness measured at 90° to both.

Problems: There are no problems associated with the measuring of maximum dimensions, although it needs to be noted that the definitions of length, width and thickness are entirely arbitrary and do not reflect any aspect of artefact manufacture.

Uses: Maximum dimensions are most useful as a broad measure of size, and may have a role in assessing fragmentation rates (particularly in the case of heat-shattered fragments) and calculating Minimum Numbers of Artefacts (MNA).

Cortex - Amount and Type

Description: Cortex refers to the 'skin' of a rock – the surface that has been weathered to a different texture and colour by exposure to the elements over a long period. The amount of cortex as a percentage of surface area will be measured on all artefacts as a percentage of the surface area (in relation to flakes, cortex can, by definition only occur on the dorsal and platform surfaces). The nature of cortex – its shape and texture – will vary depending on where the raw material was sourced.

Problems: This is a relatively unambiguous descriptive category.

Use: When a natural cobble is first selected it will usually be covered in cortex. Therefore the first artefacts produced from it will have a complete coverage of cortex on the dorsal side

(primary reduction). As the cobble is increasingly reduced the amount of cortex on each artefact will rapidly decrease (secondary reduction) until it ceases to be present on artefacts (tertiary reduction). As a result the consideration of the amount of cortex on an artefact should provide an indication of how early in the reduction sequence the artefact was produced. If large numbers of artefacts or a high proportion of the artefacts of a raw material retain cortex it may indicate that the site is located in close proximity to the source. Differences between the proportions of artefacts retaining cortex between different raw materials indicates relative differences in distance to the raw material source. This does not necessarily mean distance in terms of measurable distance across the landscape; it may also reflect the length of time since leaving the source. For example, the last campsite when a group is returning to the source of the raw material may be very close to the source in terms of distance, but distant in terms of time elapsed since the group left the source. If artefacts with cortex are occurring in sites a long distance from the place of origin of the natural cobble, then it is likely that cobbles were being transferred to the site when still only slightly reduced. This would imply an attempt to maximise the amount of stone being provisioned with the weight of transported material being a relatively minor concern.

Cortex type may help to clarify the source of the raw material. For example, river gravels are typically rounded with many microscopic conchoidal fractures on the cortical surfaces, cortex from surface scree material is generally weathered, porous, often oxidised and can be angular or rounded and material from outcrops is more likely to have flat angular surfaces or recorticated flake scars, dependent on raw material type.

1.2 Attributes to be Recorded on Flakes

In most circumstances flakes, whether broken or whole, will account for the majority of artefacts in an assemblage. Flakes are frequently produced in large numbers during reduction events, though most are never subject to use. Flakes are generally inferred to be the most utilitarian of the basic artefact categories, usually possessing a sharp edge along the entire circumference when whole and amenable to reworking patterns which may yield formal 'implements' or 'tools', such as backed artefacts and scrapers.

Knapping Type

Description: Three main knapping methods are used in the production of flakes, resulting in flakes with distinctive characteristics. The first is freehand percussion, where the objective piece is held in the hand and struck with a hard hammer (e.g. a hammerstone), resulting in 'classic' flakes with a single bulb, and a ringcrack/point of force application (PFA). The second knapping method is bipolar reduction, where the objective piece is struck against an anvil. This results in flakes that have straight sheer faces and crushing at both ends. The third is pressure flaking, where an indenter is placed against the edge from which the flake is to be removed and force is applied. The resulting flakes have a characteristically diffuse bulb, with no errailure scar and no PFA.

Problems: Ambiguities do exist in this classification, and the identification of pressure flakes in particular may be difficult, however difficulties are expected to be relatively infrequent.

Use: Freehand percussion, bipolar reduction and pressure flaking are all different approaches to reduction, with different advantages and disadvantages. Pressure flaking is the most controlled method, in terms of the location and intensity of force applied. However pressure flaking does not produce large flakes and is usually associated with fine retouching work. Bipolar reduction is usually viewed as a system employed to increase core use-life. As cores become small their inertia thresholds drop making it difficult to reduce flakes via the freehand method. Resting the core on a hard surface and using the bipolar technique allows flakes to be reduced from a core too small to hold or from small round pebbles with no

platform angle to initiate reduction. Pressure flaking when undertaken using an anvil often results in a form of bipolar reduction. Patterns in the distribution of flakes resulting from backing may be used to locate areas of backed artefact manufacture. Patterns in the distribution of flakes produced by bipolar knapping may be used to indicate where there was pressure to maximize core potential.

Artefact Breakage

Description: At a basic level, flakes break in six different ways. Three are transverse (at 90° to the direction of percussion) – proximal, medial, distal; two are longitudinal (along the plane of percussion) – left, right (oriented from the ventral view); one is a cone fracture (in which the break longitudinally bisects the bulb of percussion; and one ambiguous – transverse and longitudinal (in which dorsal and ventral can be clearly distinguished, but at least one of the lateral and proximal or distal margins are missing).

Problems: It is occasionally difficult to be certain of the breakage on an artefact. In most cases, however, the kind of breakage can be ascertained.

Use: It is important to differentiate broken from complete flakes for the purposes of analysis, as the two are not comparable in regard to a number of measures. The amount of artefact breakage in an assemblage also indicates the degree of fragmentation to which the assemblage has been subject. In highly fragmented assemblages, the actual number of artefacts represented may be significantly exaggerated. Quantifying breakage allows a more accurate approximation of artefact numbers to be made.

Heat Affect

Description: Heat will affect artefacts in different ways, depending on the way it has occurred. Most heat affected flakes on fine-grained material will reveal a greasy surface lustre on newly flaked surfaces and some discoloration (e.g. porcellanite turns from white to blue), however as heat becomes excessive signs such as potlidding (the ‘popping’ of small plate-like pieces off the flake) or crazing (multiple fracture lines in multiple directions across the face of the flake) will occur. The presence of any of these features will be recorded.

Problems: This is a relatively unambiguous descriptive attribute for fine-grained materials – its application to coarse-grained materials is perhaps less certain.

Use: Trends in the spatial distribution of heat-affected artefacts may be used to indicate either heat-treatment (the controlled application of heat to improve flaking qualities) or post-depositional burning (uncontrolled heating through bush-fires or stump burning) depending on the signs of heating and associated archaeological features (e.g. hearths).

Platform Size - Width and Thickness

Description: The platform is the surface into which force is applied in the formation of a flake. Platform width is measured across the platform in the same direction as flake width, while platform thickness follows flake thickness

Problems: Some ambiguity exists on ‘where to stop measuring’ platform width and thickness, particularly on primary cortical flakes on rounded cobbles (the first flakes removed from a natural cobble), and platform surfaces comprised of multiple flake scars. Despite this the measure appears to work quite well for the majority of flakes.

Use: Platform size is expected to decrease under two circumstances. The first is when flakes are produced from small cores. The second is somewhat more speculative and based

on the premise of a correlation between very small (focalized) platforms and the production of parallel-sided flakes (blades) associated with backed artefact manufacture.

Platform Surface

Description: Platform surface will be recorded as one of the following: cortical, single flake scar, multiple flake scars, faceted (where the platform that consists of three or more negative flake scars each of which have a clear initiation on the platform surface), ground, crushed or cortical.

Problems: This is a largely unambiguous descriptive attribute.

Use: The surface of a platform provides information about the history of the core prior to the detachment of the flake, and also about methods employed to control the flaking process. Faceting in particular has been linked to the systematic production of 'blades'. Patterns in the spatial distribution of these attributes may be used to infer differences in reduction strategies.

Overhang Removal

Description: Frequently prior to the detachment of a flake from a core, the thin overhanging 'lip' of the core was removed in order to stop 'crushing' or force dissipation at the point of force application. Overhang removal results in the presence of small regular scars along the dorsal face of the platform. For the purposes of the present analysis, an arbitrary maximum length for overhang removal scars was set at three millimetres; any scar over three millimetres is considered a dorsal scar.

Problems: This is a largely unambiguous descriptive attribute.

Use: Overhang removal is often seen as a form of raw material conservation. If a knapper desires to remove thin flakes from the face of the core by striking close to its edge, overhang removal may avoid platform crushing and the resultant flake ending in a step termination that must be removed from the face of the core before flake production can continue. Thus, raw materials within assemblages that have high relative proportions of overhang removal, or total assemblages that have high relative proportions of overhang removal, will be used to indicate raw material conservation, which can then be interpreted in relation to human resource use patterns/preferences.

Dorsal Scar Count

Description: The dorsal face of a flake provides a partial record of previous flaking episodes to have occurred down the core face at or near the same point. The number of flake scars on the dorsal surface of a flake that are clearly discernable and are longer than three millimetres in length will be recorded.

Problems: There is some ambiguity in this measure, hence the use of the term 'clearly discernable' above. Furthermore, by the nature of the flaking process, each subsequent scar will remove traces of the previous scars, resulting in an incomplete record. For these reasons, this measure needs to be treated with some caution.

Use: Dorsal scar count is a rough indication of how much flaking has occurred prior to the detachment of the flake in question. It also provides a maximum against which to form ratios of 'aberrant to non-aberrantly terminating scars', 'parallel to non-parallel scars' and 'number of scars per rotation' (see next three attributes), all of which may assist in clarifying the reduction process and assist in understanding differences in the Aboriginal use of raw materials and sites or environmental contexts.

Number of Aberrantly Terminating Dorsal Scars

Description: Aberrant terminations are further discussed below under **Terminations**. For the purposes of this description it is sufficient to say that flake scars terminating as steps and hinges will be recorded as aberrant in this assessment.

Problems: The problem(s) with this count are the same as those for the previous.

Use: As cores become smaller and more heavily reduced, the inertia threshold will fall and platform angle will increase, resulting in an increase in the number of aberrant terminations as a percentage of the number of flakes removed. Flakes that have a high number of aberrantly terminating flake scars as a percentage of the total are expected to have been produced towards the exhaustion threshold of the core. This measure may be used to indicate pressure on raw material availability and provisioning strategies.

Number of Parallel Flake Scars

Description: A basic count of the number of parallel flake scars. A dorsal scar will only be considered parallel if there are two extant parallel dorsal ridges that are clearly discernable from breaks, margins or subsequent scars.

Problems: As previous.

Use: Examining the ratio of parallel to non-parallel scars on the dorsal surface of flakes may help to clarify the prevalence of 'blade' production in the reduction systems at different places. It may also be possible to examine this ratio in relation to flake size to test whether blade production occurred at a specific stage in the reduction sequence, or whether it was present throughout the complete reduction sequence.

Dorsal Scar Rotation Count

Description: As a core is reduced it may be turned or rotated to provide new platforms or overcome problems with increasing platform angles. As a result, flakes may be detached which cut across old flake scars. The result should be apparent as dorsal scars in different direction to the direction of percussion of the flake being recorded. For a scar to be considered to provide evidence of rotation, the initiation or termination of the scar must be apparent or a medial section of a scar with clear attributes (ripple marks etc) that demonstrate the orientation of the scar must be present and it must be clear that the orientation of the scar is at more than 45 degrees to the platform or another flake scar. As with core rotations, the initial flake direction is counted as zero and subsequent rotations are counted from one.

Problems: The problem with this measure is the same as that for dorsal scar counts in general.

Use: Core rotation is increasingly likely towards the exhaustion threshold of cores, when platform angles increasingly approach or exceed 90° (it becomes very difficult to remove flakes from platforms with angles exceeding 90°). If it is possible to show a correlation between flake size and number of dorsal scar rotations then it will become possible to infer from differences in the spatial distribution of this data that core exhaustion was more frequently approached in some areas than in others. If it is not possible to show this correlation, then it may be taken to suggest that core rotation was part of the reduction strategy throughout the reduction continuum.

Termination

Description: Termination refers to the way in which force leaves a core during the detachment of a flake. Every complete flake has a termination. There are patterns in the form which terminations will take, with the major categories (those to be used here) being: feather, hinge, step, plunging, retroflexed, inflexed, axial (associated with bipolar reduction) and cortical.

Problems: This is a largely unambiguous descriptive attribute. The only point at which uncertainty does enter is in differentiating some transversely snapped flakes from step terminated flakes. In the majority of cases, however, this problem does not arise.

Use: Different terminations have different implications both for flake and core morphology. A flake with a feather termination (in which force exits the core at a low or gradual angle) will have a continuous sharp edge around the periphery beneath the platform. This has advantages in terms of the amount of the flake edge which can be used for cutting, and also makes the flake far more amenable to subsequent retouching or resharpening activities. Detaching flakes with feather terminations also has minimal impact on the effective platform angle of the core, and so platform angle thresholds are reached relatively slowly while feather terminating flakes continue to be produced.

Hinge and step terminating flakes have none of these advantages. They result in edges which are amenable neither to cutting nor to retouching. Furthermore, hinge and step terminations lead to rapidly increasing effective platform angles, leading to a requirement for core rejuvenation and core exhaustion. For these reasons, such terminations are considered undesirable or *aberrant*. The number of aberrant flake terminations is expected to increase towards the end of a core's uselife, as reduction in core size and increase in core platform angle make it increasingly difficult to detach feather terminating flakes. In areas where aberrantly terminating flakes are relatively common it may be inferred that core potential was more thoroughly exploited. From this it may in turn be inferred that the pressure to realize core potential (e.g. a strategy of heavy raw material conservation) was greater. Increased mobility/emphasis on portability is one possible explanation of such a pattern.

Plunging or outrepasse flakes have the opposite effect on core morphology to step and hinge flakes, in that they remove the entire core face and part of the core bottom. As a result, such flakes may be used to rejuvenate cores in which core angles have become high but which still retain useable potential (e.g. are still quite large). The presence of outrepasse flakes may be taken to indicate core rejuvenation and the requirement to increase core use-life.

Retouch

Description: Retouch is the term given to alterations made to a flake by the striking of subsequent flakes from its surface. Retouching may be done either to alter artefact form or to rejuvenate (resharpen) dulled edges, and possibly both. The degree of amount of retouch was recorded as a presence or absence.

Problems: This is a largely unambiguous descriptive attribute. The only area in which difficulty may arise is in instances where edge damage cannot be differentiated from retouch. This occurs infrequently, as edge damage is usually a modern alteration to artefact form that can be noted through differences in surface colour between the flake scar and the rest of the artefact surface.

Use: The two main uses of retouch need to be separated for the purposes of this discussion. Retouch to achieve form (for example, artefact backing) is distinct from retouch for the purposes of edge rejuvenation. 'Formally retouched' artefacts are anticipated to occur at places of manufacture and places of discard. Importantly, such artefacts will be

manufactured prior to use as part of a gearing up or preparation for activities such as hunting. The presence of concentrations of such artefacts, including incomplete specimens may indicate the base-camp locations from which mobile subsistence activities were conducted. Such artefacts are also expected to be present among very small assemblages at distances from occupational foci, as the result of discard, loss, or breakage.

Edge rejuvenation retouch is expected to increase as the availability of replacement materials decreases. Such artefacts are expected to represent 'personal gear', an implement carried with a person and maintained for repeated use. Unlike formally retouched pieces, artefacts with edge rejuvenation will not be produced *in preparation for* activities. The sharpest and most useful edge is a fresh edge. Rather, rejuvenation will occur as need arises. The presence of such artefacts at occupational foci is likely to represent discard following use and prior to reprovisioning/retooling. The percentage of artefacts exhibiting retouch is expected to increase in systems where large amounts of replacement raw material are not available.

It needs to be noted that a third type of retouch also occurs, aimed at neither formalisation of shape or edge rejuvenation. This is when a flake (usually a large to very large flake) has been used for the subsequent production of utilitarian flakes (e.g. when it has been used as a core as defined in '**Artefact Class**'). This strategy is quite prevalent in the Hunter Valley. Differentiating such artefacts from other retouched artefacts is empirically difficult, however, is intuitively quite easy. Any such intuitive judgements can, however, be tested during the analysis phase, as such flakes are expected to be quite distinct from other retouched artefacts in size and weight.

Retouch Type

Description: Retouch type is a technological attribute relating the way in which retouch was carried out. Categories to be used are steep, acute, unifacial, bifacial, tranchet and/or used as core. Tranchet retouch is defined as retouch that results in the removal of the majority of one or more of the flake margins, including the platform or termination. This results in the production of a flake with two ventral surfaces and may also be used to establish a secondary platform perpendicular to the original flake axis from which additional flakes may be removed.

Problems: This is a largely unambiguous descriptive attribute.

Use: Whether retouch results in a steep or acute edge is important in relation to the possible functions of those edges. Acute retouch results in sharp edges suitable for cutting whilst steep retouch can be used to totally remove a sharp edge (to blunt as in backed artefacts) or to produce thick strong edges suitable for adzing or scraping. Thus, artefact function can be suggested by recording this attribute. The recording of the technique used for retouch addresses questions related to techniques of implement manufacture and thus another form of human behaviour that can be analysed within and between assemblages.

Retouch Location

Description: Each flake will be divided into eight segments: proximal end, proximal left, proximal right, marginal left, marginal right, distal left, distal right, and distal end; with the presence or absence of retouch in each to be recorded

Problems: Apportioning sections relies on a visual division of the flake, which may be slightly inaccurate. This is not expected to be a significant effect.

Use: An examination of retouch location may reveal trends in distance decay (e.g. increasing number of margins retouched over distance, or may simply reveal non-

random patterns in the way in which retouching was carried out. If the former, then the trend may be used to suggest trajectories along which flakes were being carried as personal gear. In the case of the latter, the information would provide an insight into the manufacturing/reduction systems being employed.

1.3 Attributes to be Recorded on Cores

The following attributes are to be recorded on cores. Most information taken from cores concerns the way in which they were reduced – what pressures, controls and systems were applied.

Percentage of Surface Flaked

Description: This attribute involves an estimate of the percentage of the outer surface of the core which has had flake scars removed from it.

Problems: This is a visual estimate and liable to prove reasonably inaccurate and coarse. Nevertheless, it remains useful.

Use: This measure can be useful in assessing degree of core reduction. In particular, it can be useful in locating areas of heavy core reduction, particularly when used in concert with the following two measures.

Number of Rotations

Description: This measure mirrors **dorsal scar rotation count** as discussed above.

Problems: This measure has the same problems as **number of flake scars**.

Use: Different reduction systems use core rotation in different ways. In some systems, cores are rotated only once, after the striking of the initial flake to form a platform. All subsequent scars are removed in one direction from that platform. Other systems will involve repeated rotations between two platforms, or may involve continuous core rotation and numerous platforms. It may be the case that through the use-life of a core a number of different strategies will be used.

Assessing core rotation may help to clarify reduction systems, and the stage in the reduction system at which the individual core was discarded. This can be used to indicate differences in use of raw materials both within assemblages and between assemblages.

Number of Aberrantly Terminating Scars

Description: Flake scars terminating as steps and hinges will be recorded as aberrant in this assessment.

Problems: There should be no problems with this simple count.

Use: As cores become smaller and more heavily reduced, the inertia threshold will fall and platform angle will increase, resulting in an increase in the number of aberrant terminations as a percentage of the number of flakes removed. Flakes which have a high number of aberrantly terminating flake scars as a percentage of the total are expected to have been produced towards the exhaustion threshold of the core. This measure will be used to indicate pressure on raw material availability and provisioning strategies.

1.4 Comments

Description: A column will be supplied in the data base for recording comments. This may include comments on attributes such as artefact colour, granularity, presence and nature of inclusions, or other comments that do not fit into other attribute classes.

The comments column may include additional typological information outside that included within the artefact class attribute. In the case of the present assemblage, this includes the description 'scraper' for relatively thick flakes that exhibit steep retouch to create a margin or margin(s) that indicate that the artefact may have been used as a scraper. Other interpretive comments include 'redirecting flake' (a flake that uses a former platform as a dorsal ridge to redirect the fracture plane), 'rejuvenating flake' (a flake that has a former platform as a dorsal ridge and that has a plunging termination that removed a section of the core in order to facilitate subsequent reduction of the core) and 'platform removal flake' (a flake that contains a former platform on the dorsal surface).

Problems: Comments on the purpose of an artefact are confined to the comments section to avoid subjectivity in attribute recording. As these comments are defined above, there should be no problems.

Use: Descriptions of artefacts can sometimes be useful for assisting in locating conjoins and providing additional information regarding the non-formal types of artefacts within an assemblage.

ATTACHMENT 3

Research Design and Methodology

Attachment 3 – Research Design and Methodology

1.0 Introduction

This attachment provides a research design and methodology for the mitigation activities recommended in Section 8 of the main text.

2.0 Research Design

Previous archaeological investigations in the Stockton Bight area have identified several themes in relation to enhancing our knowledge of how Aboriginal people used this area (refer to ERM 2006), namely; identifying the distribution of sites within the landscape (their geomorphic context); the need for obtaining chronological information in relation to site/landscape use; gaining a greater understanding of processes of site formation and preservation to assist with site/landscape use interpretation; and the consideration of chronological changes in settlement patterns and resource use.

The relationship between the distribution of archaeological material and geomorphic context is one of the primary considerations raised by previous archaeological assessments. The proposal areas include three of the major geomorphic units that comprise Stockton Bight in the form of Ridge I, Ridge II and Ridge III dunes and associated stabilised soil surfaces. The presence of all three of these geomorphic units within areas recommended for further archaeological investigation (involving both surface and sub-surface investigations) therefore provides a valuable opportunity to further refine the predictive model for the distribution and nature of archaeological deposits, not only within the proposal areas but also within the adjoining Worimi Conservation Lands (which are not likely to be subject to archaeological investigation).

In addition, it is possible that specific portions of the proposal areas may contain sub-surface deposits in a relatively undisturbed context (refer to Section 5.2.3 of the main text) and that these deposits may include materials suitable for dating and for examining processes of site formation. In order to adequately understand and interpret excavated materials, it is essential to consider the natural and cultural processes that impact upon sites before and after their initial deposition. These processes may affect the distribution and integrity of deposits within the site. Provided that these processes are understood, the analysis of concentrated sub-surface deposits that contain datable materials and retain a degree of integrity allows for consideration of changes in site/landscape use or resource use over time. The recommended mitigation activities within the Lot 218 and Lot 220 proposal areas therefore have the potential to address the research questions provided below.

1. What is the distribution of former stabilised soil surfaces within the Lot 218 proposal area and what are the implications of this for adjoining areas of land outside the proposal areas that contain the same geomorphic unit? This information will provide us with a better understanding of where we can expect to find stabilised soil surfaces and the associated archaeological material they may contain, which in turn, will assist in refining predictive models for the area (as discussed above).
2. Is the distribution of archaeological material within the Lot 218 and Lot 220 proposal areas similar to that identified in similar environmental contexts within Stockton Bight that have been subject to prior investigation? Again, this will assist in refining predictive models for the area.

-
3. Is it possible to obtain absolute dates for salvaged archaeological material and if so, is it possible to identify chronological change in site distribution, resource use or artefact manufacturing techniques?
 4. Do the salvaged archaeological materials indicate use of specific resource zones or is there evidence for the use of different resource zones (e.g. estuarine and beach) within one site?
 5. To what extent are the salvaged archaeological materials affected by site formation processes and can these processes be readily identified? When interpreting excavated archaeological material it is critical to be able to identify how/if taphonomic processes have affected the distribution and/or preservation of the archaeological material in the site. If the affects of taphonomic processes can be identified, a more accurate interpretation can made in relation to the cultural practices that led to that site's formation.
 6. Is it possible to identify different activity areas within individual sites or between different geomorphic/landscape contexts?

These research questions are targeted at gaining a better understanding of how Aboriginal people used the area in a broader landscape context, information which may have applications both within the proposal areas (in terms of refining the required mitigation activities) and within the Worimi Conservation Lands (where additional archaeological investigation is unlikely).

3.0 Methodology

The methodology provided in this section relates specifically to mitigation activities within the proposal areas, as recommended in Section 8 of the main text. The recommended mitigation activities include: surface collection; test excavation and sub-surface salvage. The mitigation activities are tiered, with specified outcomes leading to a requirement for further mitigation activities, resulting in the maximum archaeological benefit from these activities.

3.1 Surface Collection

Surface collection will be undertaken within the Lot 218 proposal area at any exposed stabilised soil surface subject to impact (refer to Section 8.2 of the main text) and within the Lot 220 proposal area at any location where surface archaeological material is identified during post-clearance inspection (refer to Section 8.3 of the main text). The spatial recording, collection and subsequent analysis of surface archaeological material within these areas will provide information about the distribution of archaeological material and may provide information regarding the location of specific activity areas. The proposed surface collection methodology is provided below.

- The distribution of surface archaeological material will be assessed and where appropriate, archaeological material will be grouped into loci for the purposes of recording and analysis.
- All surface archaeological material and/or loci of surface archaeological material will be flagged and photographed.
- The location of each loci or isolated area of surface archaeological material will be recorded and mapped using a hand-held 12 channel GPS, with records to be taken in three dimensions (easting, northing and elevation).

3.2 Methodology for Test Excavations

Test excavations have been recommended for any area of stabilised soil surface within the Lot 218 proposal area that is subject to impact and is identified as a PAD and within any area of the Lot 220 proposal area that contains high densities of stone artefacts, shell or bone fragments (as assessed by an archaeologist and the relevant Aboriginal stakeholders). The proposed methodology for test excavations is provided below.

- The area of stabilised soil surface subject to impact (in relation to the Lot 218 proposal area) or containing a high density of archaeological material (in relation to the Lot 220 proposal area) will be clearly defined and demarcated by an archaeologist and the relevant Aboriginal stakeholders.
- The defined area will then be divided into a grid with 10 metre intervals, or if the dimensions of the area to be impacted are not sufficient, a grid with 5 metre intervals.
- A pit measuring approximately 50 centimetres by 50 centimetres will be excavated at the intersection of each of the 10 metre intervals (or 5 metre intervals for areas on a 5 metre grid), with the exact spacing and location of the pits to be determined in the field in order to avoid excavating in areas of localised disturbance.
- All pits will be excavated in approximately five centimetre spits to a minimum depth of 30 centimetres but may continue to the top of the B horizon or to the maximum achievable depth within a 50 centimetre by 50 centimetre pit (taking into account OH&S restrictions and the inherent difficulties of excavating in sand). It is unlikely that the B horizon will be reached in test pits however it is argued that excavation to a depth of 30 centimetres within a stabilised soil surface will provide a very good indication of the nature of any archaeological materials it may contain.
- All excavated materials (with the exception of sediments from a hearth or heat treatment pit) will be passed through a five millimetre and two millimetre gauge sieve (where soil texture and level of moisture allows) in order to ensure that all archaeological material is retained.
- Should a possible hearth or heat treatment pit be identified during salvage activities, the following methodology will be followed:
 - the surface of the feature will be cleaned by hand (using trowels, hand shovels and brushes as required) to allow the edges of the feature to be identified;
 - the feature will then be excavated in cross-section (half-sectioned) to investigate the dimensions and orientation of the feature to more accurately assess whether it is a cultural feature or the result of natural process (for example, a burnt tree root/stump). The excavation will proceed according to the stratigraphy (if any) of the in-filling materials;
 - if it is identified as a hearth/heat treatment pit, it will be photographed in cross-section and a stratigraphic profile of the cross-section will be recorded;
 - if it is identified as a hearth/heat treatment pit, it will then be excavated in its entirety. All excavated materials (including those from original cross-sectional excavation) will be retained for analysis and samples of relevant materials will be sent for additional analysis, including radio-carbon dating;

-
- if the feature is identified as a hearth or heat treatment pit, the excavation of the feature will continue until the relevant Aboriginal stakeholder representatives and the archaeologists agree that the entire feature has been removed;
 - following the removal of all in-filling material within a hearth or heat treatment pit, the remaining cut feature will be planned to scale and photographed; and
 - following this excavation can resume in the vicinity of the excavated feature.

3.3 Methodology for Salvage Excavations

Salvage excavations will be undertaken within areas of Lot 218 and Lot 220 proposal areas where test excavations have identified consolidated shell midden deposits, artefact assemblages of a specific nature and/or hearths/heat treatment features (refer to Section 8.2 and Section 8.3 of the main text). The proposed methodology for salvage excavations is outlined below:

- The area to be subject to salvage excavation will be clearly defined and demarcated by an archaeologist and the relevant Aboriginal stakeholders.
- The defined area will then be divided into a grid with one metre intervals.
- A number of one metre by one metre squares equivalent to at least 40% of the defined salvage area will then be selected by an archaeologist and the relevant Aboriginal stakeholders in order to include the portions of the salvage excavation area most closely associated with the identified archaeological materials discussed above. These squares will constitute the initial excavation squares. Additional squares may be excavated if necessary to obtain a representative sample of consolidated shell material or stone artefact scatters or to complete the excavation of a hearth or heat treatment feature (refer to **Section 3.2** above). The location of any additional squares will be determined by an archaeologist and the relevant Aboriginal stakeholders.
- The squares will be one metre by one metre in size and will be excavated in 50 centimetre quadrants using five centimetre spits until the B horizon is reached or the excavation becomes unsafe, whichever comes first (it may be necessary to step or shore the excavation if the sand becomes unconsolidated).
- All excavated materials (with the exception of sediments from a hearth or heat treatment pit) will be passed through a five millimetre and two millimetre gauge sieve (where soil texture and level of moisture allows) in order to ensure that all archaeological material is retained.
- Should any features (such as a hearth or heat treatment pit) be identified, they will be excavated in accordance with the methodology provided in **Section 3.2**.