



21 June 2019

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Via email: adnan.voloder@boral.com.au

Dear Adnan,

**RE. DUNMORE LAKES SAND EXTRACTION PROJECT (DA 195-8-2004) MODIFICATION 2
ABORIGINAL CULTURAL HERITAGE - RESPONSE TO SUBMISSIONS**

Boral Land & Property Group ('Boral') has been requested to provide a Submissions Report in response to submissions made by the public and government agencies during the exhibition period of the Environmental Assessment (EA) for the Dunmore Lakes Sand Extraction Project Modification 2. Kelleher Nightingale Consulting (KNC) has prepared this letter on behalf of Boral to assist with the Department of Planning & Environment (DP&E) and Office and Environment and Heritage (OEH) requests for additional information.

DP&E comments and response

8. Aboriginal Cultural Heritage Impacts

- Please provide a revised Aboriginal Cultural Heritage Report which details proposed conservation measures, includes further consultation with local Aboriginal parties and considers the potential cumulative impacts of the proposal on Aboriginal heritage in the region.

An updated Aboriginal Cultural Heritage Assessment Report (CHAR) has been prepared which addresses the issue of conservation, includes additional consultation with Registered Aboriginal Parties (RAPs) for the project, and includes discussion of cumulative impact.

- Please prepare the revised report following consultation with OEH, registered Aboriginal parties and the Illawarra Local Aboriginal Land Council.

The revised report has been prepared in consultation (via telephone) with Rose O'Sullivan OEH archaeologist (Illawarra) Conservation and Regional Delivery Division on 6 June 2019. Registered Aboriginal parties were issued (via email) a copy of the revised CHAR for a two week comment period commencing 14 June 2019.

OEH general comments and response

Aboriginal Cultural Heritage

- There are three recorded Aboriginal cultural heritage sites that would be totally and directly harmed by the modification area. Two of the sites proposed to be impacted are of high cultural and moderate to high archaeological significance. No conservation measures are proposed, and members of the Aboriginal community have raised concerns with the proposal. The archaeological deposits are in the same landforms as the sand that is proposed to be extracted. The conclusion of no 'significant impacts' arising from the proposal does not consider the loss of Aboriginal heritage through this expansion.

It is noted that salvage is a commonly applied form of mitigation, and is proposed to be implemented in the current proposal. The updated CHAR provides further discussion on this point in Section 11, page 58.

- We recommend that conservation options be considered for the proposed modification, given the significance of the Aboriginal heritage sites. If the proposed modification proceeds, partial conservation may be achieved by avoiding harm to the south east corner of extraction area Stage 5A and the eastern side of Stage 5B. Further consideration of the cumulative impact of development on sites of this type in the region, and an assessment of any associated archaeological deposits in the remaining sand body at Minnamurra, would assist to fill existing gaps in the assessment and more fully establish the extent of proposed impacts.

Addressed in the updated CHAR (Section 9 p.56 and Section 10 p.57).

OEH detailed comments and responses

2. Aboriginal Cultural Heritage

Key Aboriginal cultural heritage recommendations

- The outcomes of the Aboriginal community consultation and Aboriginal cultural significance should be included in the Environmental Assessment (EA).

The DSS Mod 2EA submitted for assessment addressed aboriginal heritage in Chapter 7.2. Consultation completed as part of the CHAR is included in Section 2, page 6.

- If the expansion proceeds, options to reduce the extraction areas to conserve parts of the identified Aboriginal heritage sites should be investigated.

Addressed in the updated CHAR (Section 10 p.57).

- An Aboriginal cultural heritage management plan should be developed if the expansion is approved.

Following discussion with OEH, addressed in an expanded section in the updated CHAR (Section 11 p.58).

- The ACHAR should include an assessment of cumulative impact.

Addressed in the updated CHAR (Section 9 p.56).

- The ACHAR should consider lands adjoining the proposed extraction area, whether archaeological deposits of a similar nature are present in those lands, and if there are potential heritage conservation options on that land.

Addressed in the updated CHAR (Section 10 p.57, Section 11.7 p.60).

Aboriginal community consultation

Aboriginal community consultation has occurred with the nineteen Registered Aboriginal Parties (RAPs) for this project. Support of the ACHAR was received from seven of the RAPs. Woronora Plateau Gundungara Elders Council (WPGEC) has objected to the proposed sand extraction (KNC 2019, pp.76-79). The WPGEC submission includes a petition signed by 35 Aboriginal community members who oppose the quarry expansion. Some of the people who have signed the petition are also RAPs for this project.

WPGEC argue that:

- Extending the quarry for 3-4 years will cause *'irreparable and complete destruction of a rare and valuable natural and cultural landscape'*.
- The land is one of *'very few undisturbed estuarine environments remaining the Illawarra region... holds an intact and rich archaeological site and encompasses land of cultural and modern historical importance'*.
- The test excavation results provide enough archaeological information and therefore the proposed salvage excavations are not required if the expansion does not proceed.
- The proximity to the massacre site (approximately 500m south) and the Minnamurra River should result in appropriate respect for *'the site and its surrounds'*.
- The landscape is likely to contain Aboriginal burials, unconnected to the massacre site.

KNC (2019, p.7) has responded to WPGEC that the proposed salvage excavation will provide information to mitigate the loss of sites and help manage archaeology in similar sand bodies. They argue that the archaeology does not connect to the massacre site.

The outcomes of the Aboriginal community consultation should be included in the EA. The EA should also consider the Aboriginal cultural significance (EA pp.91-92).

The purpose of the DSS Mod 2 EA is to provide information about a proposal, and outline significant findings, and advise readers where additional information, in relation to specialist technical studies can be found. This is done to avoid duplication and repetition of findings. The outcome of consultation completed for the CHAR can be found in Section 2 page 6.

No conservation measures are proposed

No conservation measures are proposed. The WPGEC submission requests that no extraction occurs given the harm to Aboriginal heritage that will be caused.

If the development proceeds, we recommend reducing the extraction areas to conserve parts of the identified Aboriginal heritage sites. For example, conservation may be achieved by avoiding harm to the south east corner of extraction area Stage 5A and the eastern side of Stage 5B. However, this may not remove the requirement for additional archaeological excavation and salvage in the remaining parts of the extraction areas.

Addressed in the updated CHAR (Section 10 p.57).

Cumulative impact

The ACHAR should include an assessment of cumulative impact. The assessment should consider loss of sand deposits in this area and accompanying loss of Aboriginal cultural heritage.

We also suggest the assessment should consider lands adjoining the proposed extraction area, whether archaeological deposits of a similar nature are present in those lands, and if there are potential heritage conservation options on that land.

Addressed in the updated CHAR (Section 9 p.56, Section 11.7 p.60).

Archaeological test excavations

KNC (2018) excavated 45 test pits within the proposed expansion area under the Code of Practice for Archaeological Investigation of Aboriginal objects in NSW. Three sites were identified. Two of these have high average artefact densities for this region (KNC 2019, p.50).

The test excavations have not accurately defined the bounds of the recorded sites. This means that the full nature and extent of these sites is not known. Test excavation should have continued beyond the high artefact bearing test pits on the edges of the test excavation areas to more accurately define the boundary of the archaeological deposit. However, it is likely that the archaeological deposit extends throughout the entire expansion areas.

The reliability of the test excavation program should be considered in light of Way (2017). This is given the potential for intact, clustered artefact scatters and the 20m spacing between test pits.

Additional information should be provided about the fill identified at test squares 1-3 (KNC 2019, p.31) and how this compares to areas of fill where there were intact sand deposits below. It is possible that excavating deeper than the fill may have identified underlying sand deposits, and associated archaeology. As this is in the proposed sand extraction area we presume there are sand deposits present that were simply not located by the archaeological test excavations.

The reliability of the test excavation program and the 20m spacing between pits is addressed in the updated CHAR (Section 6.2 p.30).

Additional information about the fill identified at test squares 1-3 is provided in the updated CHAR (Section 6.3.1.1 p.32).

Compliance with the Code of Practice

Several pieces of additional information are required to comply with the Code of Practice for Archaeological Investigation of Aboriginal objects in NSW:

- Photographic and scale drawn records for the test pits must be provided in accordance with Requirement 16a (11) of the Code.

Addressed in an Appendix to the updated CHAR (Appendix F pp.95-111).

- The Code of Practice (16a, 9) requires that archaeological test pits are excavated to at least the base of Aboriginal object bearing units and must continue to confirm the soils below are culturally sterile. KNC must explain how this requirement of the Code has been met. KNC (2019, p.34) comments that it is possible that cultural material occurs in deeper sandy deposits.

Addressed in updated CHAR (Section 6.3.1.2 last paragraph).

- Survey coverage data in accordance with Requirements 9 and 10 of the Code is needed to help determine the effectiveness of the survey.

Addressed in the updated CHAR (Section 5 pp. 27-28, Tables 2a and 2b).

There is potential for burials to occur in this landscape

Aboriginal burials are known to occur in sand deposits such as those at Dunmore and across the NSW South Coast. It can be very difficult to predict or identify burial locations through archaeological investigations. A procedure for the identification of Aboriginal remains is proposed, as KNC note that it is difficult to identify Aboriginal burials through test excavation (KNC 2019, p.7).

There are historic records of a massacre in 1818 at Minnamurra, thought to be approximately 500m south of the extraction area (KNC 2019, p.15). KNC (2019, p.7) report that the massacre site is not understood to be in the extraction area. However, the exact location of burials from the massacre is not known.

Consultation on a nearby AHIP application has indicated that the burial of William Walker (Woolongoolow) is near the Minnamurra River, although again the exact location is unknown (Biosis 2018, p.11).

Navin (1989, p.6) reports oral history from Mr Cedric Rutledge of 'Clevehurst', Jamberoo, that 'there is some knowledge of burials along the Minnamurra estuary near Dunmore', although no detail is provided of exact locations.

A further reference to burials in the Minnamurra region comes from Lilley (1987). Lilley reports that Mr Dick Henry of ILALC told him that almost 3000 Aboriginal people died in the Shellharbour area at the end of the eighteenth century, with the deaths caused by an epidemic (Lilley 1987, p.7). Mr Henry believes the dead were buried around the Minnamurra River.

Noted. Additional discussion of Aboriginal burials has been included in the updated CHAR (Section 4.2 p.21) and a management procedure for human remains is included in the management recommendations (Section 11.4 p.59).

Clarification of whether additional sites will be harmed is required

- Site 52-5-0253

The pumping station / booster pad, access road extension and pipeline corridor all occur in the vicinity of site 52-5-0253. The site card states that the boundaries of the site are not known. It does not appear that any test excavation has been conducted to establish the boundaries of this site. We recommend additional archaeological investigation to determine whether the proposed works will harm site 52-5-253. Justification of the KNC (2019, p.20) conclusion that site 52-5-0253 will not contain deep or intact archaeological deposits is required.

Clarification of site location addressed in the updated CHAR (Section 4.2 p.20, paragraph 4).

- Site 52-5-0117

The site card for site 52-5-0117 describes several areas of exposed archaeological material. The site is mapped south of Stage 5B however we recommend further archaeological assessment to clarify the extent and nature of the site, particularly whether it continues north into the Stage 5B extraction area.

Clarification of site location addressed in updated CHAR (Section 4.2 p.19, paragraph 4).

Archaeological salvage excavation is proposed

Archaeological salvage excavation is appropriate as mitigation where harm to Aboriginal heritage sites cannot be avoided. KNC (2019, pp.83-85) provides a methodology for the proposed archaeological salvage excavation. In relation to this methodology, we recommend:

- The excavation of squares on 20m intervals be reconsidered to provide flexibility for squares to be excavated at smaller intervals.

Noted. Addressed in updated Salvage Methodology (CHAR Appendix E p.91 'Phase 1', paragraph 2).

- The methodology should include the size of the Phase 1 test pits and the indicative number of pits.

Noted. Addressed in updated Salvage Methodology (CHAR Appendix E p.91 'Phase 1', paragraphs 1 and 2).

- More than 75-100m² of open area salvage excavation may be required, based on previous salvage excavations of similar sites. A minimum of 100m² of excavation will likely be required, and this may be required at both DLS Boral AFT 1 and 2. This is based on:
 - A larger open area may be needed to step down to reach deep deposits
 - Salvage of a similar size to excavations of similar sites assists comparison between sites.
 - The test excavations have not identified the extent of the sites, which could be very large.
 - If the Modification is approved these sites will be destroyed and the salvage excavation will be the only opportunity for the recovery of archaeological information.

Noted. Addressed in updated Salvage Methodology (CHAR Appendix E p.91 'Phase 2', paragraphs 1 and 2).

An Aboriginal cultural heritage management plan should be developed

If this modification is approved, we recommend the applicant develop an Aboriginal cultural heritage management plan (ACHMP). The plan should provide a process to manage Aboriginal cultural heritage impacts and mitigation works through the life of the quarry. The ACHMP should be prepared in consultation with the RAPs. OEH can also provide technical advice on preparing the ACHMP.

Addressed in an expanded section in the updated CHAR (Section 11 p.58).

Long term artefact management

We recommend the long term management of excavated Aboriginal objects is determined as soon as possible. KNC (2019, p.57) suggest two options: lodging with the Australian Museum and reburial. This must be determined in consultation with the RAPs.

Noted. Management of salvaged Aboriginal objects is outlined in Section 11.1.2 of the updated CHAR. Long-term management will be determined in consultation with the project RAPs.

Minor corrections to the ACHAR and EA are required

There is a typographical error in section 7.2.1 of the EA (p.84): forty-five test pits, not sites, were excavated. We recommend this is corrected to avoid confusion.

Noted.

The EA and ACHAR (KNC 2019, p.5) state there are nineteen Registered Aboriginal Parties for this project, however 20 RAPs are listed in the ACHAR. KNC must clarify whether Mr Caines is a RAP on this project. Gary Caines is missing from the list of RAPs at s4.1.3 of the Consultation Log (KNC 2019, p. 62). Mr Caines is also not listed on the notification of RAPs provided to OEH on 31 July 2018. However, Mr Caines is listed in Table 1 of the ACHAR (KNC 2019, p.5).

Addressed in updated CHAR (Section 2.1 p.5, Table 1). It is confirmed that nineteen RAPs are registered for the project.

The ACHAR statement of significance (KNC 2019, p.52) should be updated to reflect the results of consultation, as it currently states that the significance assessment will be finalised after RAP review of the ACHAR.

Addressed in updated CHAR (Section 8 p.53 and Section 2.7 p.9).

I hope this additional information assists you. If you have any questions or require further information please don't hesitate to contact me on 02 9232 5373.

Yours sincerely



Dr Matthew Kelleher
Director/Archaeologist



**DUNMORE LAKES SAND PROJECT – STAGE 5 MODIFICATIONS
DUNMORE, NSW**

Aboriginal Cultural Heritage Assessment Report

Prepared for Element Environment Pty Ltd
on behalf of Dunmore Sand and Soil Pty Ltd

Shellharbour Local Government Area

June 2019

Ref. 1745

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Executive Summary

Dunmore Sand and Soil Pty Ltd (DSS) is seeking approval for a modification to their existing development consent (DA 195-8-2004) for Stages 2 to 4 of the Dunmore Lakes Sand Project at Dunmore on the NSW South Coast. The proposed modification is for a new extraction stage (Stage 5) on adjoining land and would be a S75W modification to the existing consent. The proposed pit expansion is required to enable the continuation of the current sand extraction operations.

Kelleher Nightingale Consulting Pty Ltd (KNC) was engaged by Element Environment Pty Ltd on behalf of Boral Resources (NSW) Pty Ltd (Boral) as the owner of DSS to prepare an Aboriginal Cultural Heritage Assessment Report (CHAR) to inform the environmental assessment (EA) for the expansion project. The CHAR assessment process has included detailed Aboriginal cultural heritage assessment comprising Aboriginal community consultation and archaeological investigations, including a test excavation program.

The assessment was carried out in accordance with the Office of Environment and Heritage (OEH) requirements and guidelines for Aboriginal community consultation and archaeological assessment including the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW; Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW and Aboriginal cultural heritage consultation requirements for proponents 2010*.

Consultation with registered Aboriginal stakeholders was undertaken to identify Aboriginal heritage in the study area, assess impacts of the proposed expansion activities and develop appropriate mitigation measures.

Three Aboriginal archaeological sites were identified in the proposed pit expansion area: DLS Boral AFT 1, DLS Boral AFT 2 and DLS Boral AFT 3. All three sites would be impacted by the proposed works.

Archaeological significance of the identified Aboriginal sites was determined by their research value, representativeness, intactness and rarity. On the basis of these criteria, sites DLS Boral AFT 1 and DLS Boral AFT 2 display moderate-high archaeological significance and site DLS Boral AFT 3 displays low archaeological significance.

Consultation with the 19 registered Aboriginal stakeholders identified that the study area has cultural heritage value to the local Aboriginal community. In particular, Aboriginal stakeholders expressed the cultural importance and significance of the landscape around the study area. Boral values Aboriginal community consultation and is committed to ongoing consultation with Aboriginal stakeholders for the Dunmore Lakes Sand Project.

A mitigation program comprising archaeological salvage, undertaken prior to the commencement of the proposed works, is required where portions of significant Aboriginal sites would be impacted by the proposal. Significant Aboriginal sites are identified as exhibiting at least moderate archaeological value. Two sites within the study area require salvage excavation: DLS Boral AFT 1 and DLS Boral AFT 2.

The significance of the DLS Boral AFT 1 and DLS Boral AFT 2 archaeological resource resides in the information it contains, its intactness and rarity in the local region. Sites DLS Boral AFT 1 and DLS Boral AFT 2 contain a large number and diverse range of cultural material, have largely intact stratified deposits, and are in fair to good condition with some surface disturbance. The rarity of the archaeological landscape and selective nature of the identified Aboriginal objects means that recovery of the sites' information will offer substantial scientific and cultural knowledge. In this regard, salvage excavation of DLS Boral AFT 1 and DLS Boral AFT 2 is a suitable heritage outcome for the archaeological sites as it will retrieve and curate a representative sample of the information exhibited by the archaeological sites.

A modified development consent is sought for the entirety of the lands subject to the proposed Stage 5 expansion and specifically for Aboriginal objects associated with the following sites:

DLS Boral AFT 1	AHIMS 52-5-0907	Moderate-High significance	Total Impact	Salvage excavation to mitigate impact
DLS Boral AFT 2	AHIMS 52-5-0908	Moderate-High significance	Total Impact	Salvage excavation to mitigate impact
DLS Boral AFT 3	AHIMS 52-5-0909	Low significance	Total Impact	No mitigation required

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1 Introduction

Dunmore Sand & Soil Pty Ltd (DSS) is seeking approval for a modification to their existing development consent (DA 195-8-2004) for Stages 2 to 4 of the Dunmore Lakes Sand Project at Dunmore on the NSW South Coast. The proposed modification is for a new extraction stage (Stage 5) on adjoining land and would be a S75W modification to the existing consent. The proposed pit expansion is required to enable the continuation of the current sand extraction operations. The proposed expansion location (the 'study area' for this assessment) is shown in Figure 1.

The original application for Stages 2 to 4 was lodged in 2004, and the Project received development consent from the Minister for Planning in 2005. The consent approves extraction of up to 800,000 tonnes per annum of sand for a period of 25 years. Boral Resources (NSW) Pty Ltd (Boral) purchased DSS (including the Project) in mid-2005. Due to the high demand for sand in the Sydney market, existing approved dredging has moved recently to Stage 3, which is expected to be exhausted in 3 to 4 years. The last approved extraction stage, Stage 4, will be extracted progressively in stages, as it holds the site road access and private rail line and services for the Project and Boral's Dunmore hard rock quarry. This has led DSS to investigate other local sources of sand to continue the Project beyond Stage 3.

DSS has been investigating a fine sand resource located to the south of Stages 2-4. Drilling has confirmed that there is enough sand to support 3 to 4 more years of extraction from two areas (Stage 5A and 5B) (Figure 2). The proposed works for Stages 5A and 5B are located within Lot 51 DP 1012246 and Lot 502 DP 1174897 in the Shellharbour Local Government Area (LGA).

The previous Aboriginal cultural heritage assessment for Dunmore Lakes Sand Extraction Stages 2, 3 and 4 was completed by Robert Paton Archaeological Studies in 2004, including a site survey and consultation with the local Aboriginal community. The archaeological field survey identified the Raised Wetland Rim landform as having moderate archaeological sensitivity and the likelihood for containing artefact scatters. A test excavation program was recommended in these areas if any impacts were proposed, in order to make a full assessment of significance and to create and implement management and mitigation measures for any Aboriginal archaeological sites likely to be impacted by the proposed sand extraction works.

Kelleher Nightingale Consulting Pty Ltd (KNC) was engaged by Element Environment Pty Ltd on behalf of Boral to undertake an Aboriginal archaeological assessment and prepare an Aboriginal Cultural Heritage Assessment Report (CHAR) to inform the environmental assessment (EA) for the proposed Stage 5 expansion project.

The CHAR has been prepared in accordance with the EA requirements for the project and Office of Environment and Heritage (OEH) requirements and guidelines for Aboriginal community consultation and archaeological assessment.

1.1 Location and scope of activity

The proposed development area (hereafter referred to as the 'study area') is situated in Dunmore, approximately 120 kilometres south of the Sydney CBD (Figures 1 and 2). The proposed extraction sites are located within Lot 51 DP 1012246 and Lot 502 DP 1174897 in the Shellharbour Local Government Area (LGA). Required access routes and sand pipelines have also been included in the study area.

The proposed activities associated with sand extraction include:

- Vegetation clearance;
- Extraction of sand by excavator (Stage 5A with a total area of 3.42 ha, and Stage 5B with a total area of 8.12ha);
- Dredging and pumping the sand onto the existing processing area on Stage 2 for washing, stockpiling and dispatch;
- Installation of two pumping stations/boosters;
- Installation of sand pipeline connecting extraction and processing areas;
- Installation of two access roads, 240 metres and 970 metres in length, 3.5 metres in width; and
- Installation of a temporary portable site office and 10 light vehicle spaces

1.2 Project requirements

The objective of the Aboriginal cultural heritage assessment was to combine Aboriginal community consultation with archaeological investigation to identify if the proposed expansion would impact on Aboriginal cultural heritage and if so, what measures could be undertaken to manage or mitigate Aboriginal heritage impacts.

The assessment was carried out in accordance with the:

- NSW Department of Planning and Environment requirements;
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (OEH 2010b);
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011); and
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (OEH 2010c).

The assessment included:

- effective consultation with Aboriginal communities to identify Aboriginal heritage in the study area, assess impacts of the proposed expansion activities and develop appropriate mitigation measures;
- detailed archaeological investigation of the study area, including archaeological test excavation;
- Aboriginal cultural heritage assessment, including both cultural and archaeological significance; and
- preparation of impact mitigation and management measures.



Figure 1. Location of the study area (Stage 5 Modification)



Figure 2. Proposed expansion area (Stage 5A and Stage B).

2 Aboriginal Community Consultation

The aim of Aboriginal community consultation is to integrate cultural and archaeological knowledge and ensure registered stakeholders have information to make decisions on Aboriginal cultural heritage. For the preparation of this CHAR consultation with Aboriginal people has been undertaken in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (OEH 2010c) and the requirements of Clause 80C of the *National Parks and Wildlife Regulation 2009*. The formal consultation process has included:

- government agency notification letters (letters dated 08/06/2018);
- advertising for registered stakeholders in local media (*Illawarra Mercury* 20/04/2018: refer Appendix A);
- notification of closing date for registration (25/07/2018);
- ongoing compilation of registrants list, through continuing to register individuals and groups for consultation on the project;
- provision of project information and proposed cultural heritage assessment methodology (letters dated 20/08/2018) allowing for a 28 day review period;
- provision of proposed test excavation methodology for comment and review (20/08/2018), allowing for a 28 day review period;
- provision of draft CHAR (25/01/2019), allowing for a 30 day review period; and
- ongoing consultation with the local Aboriginal community.

Aboriginal stakeholders were consulted throughout all stages of the assessment process. A full log of consultation is attached as Appendix B. Boral is committed to ongoing consultation with the Aboriginal community.

2.1 Registration of interest

Aboriginal people who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the area were invited to register an interest in a process of community consultation. Nineteen groups or individuals registered an interest in the project. Investigations included consultation with Aboriginal community individuals and groups as listed in Table 1.

Table 1. Registered Aboriginal stakeholders

Registered Aboriginal Stakeholder	Representative and/or Contact Person
Illawarra Local Aboriginal Land Council	Paul Knight
Duncan Falk Consultancy	Duncan Falk
Leanne Tungai	Leanne Tungai
Darug Land Observations	Anna O'Hara
Woronora Plateau Gundangara Elders Council	Kayla Williamson
Goobah	Basil Smith
Biamanga	Janaya Smith
Cullendulla	Corey Smith
Gulaga	Wendy Smith
Murramarang	Roxanne Smith
Guunamaa Dreamin Sites and Surveying	Richard Campbell
Tungai Tonghi	Troy Tungai
Murra Bidgee Mullangari Aboriginal Corporation	Ryan Johnson
Muragadi Heritage Indigenous Corporation	Jesse Johnson
Merrigarn Indigenous Corporation	Shaun Carroll
Barraby Cultural Services	Lee Field
Yurrandaali Cultural Services	Bo Field
Wodi Wodi Coomaditchie Aboriginal Corporation	Heather Ball
James Davis	James Davis

2.2 Consultation regarding the land and proposed activity

Following on from Stage 1 of the consultation process undertaken by KNC (stakeholder identification and registration), project-specific consultation was undertaken. Information regarding the proposed extraction project was provided to registered Aboriginal stakeholder groups in a letter dated 20/08/2018. Information included an outline of the proposal, location of the study area, development approval context and an invitation to consult during the assessment.

Stakeholders were also provided with the proposed assessment methodology for the Cultural Heritage Assessment Report, and invited to review and provide feedback (review period of 28 days, closing on 17/09/2018). An invitation was extended for Aboriginal cultural knowledge holders and stakeholders to provide comments on the proposed cultural heritage assessment methodology, including any protocols regarding the gathering of information and any matters such as issues/areas of cultural significance that might affect, inform or refine the assessment methodology.

2.3 Stakeholder responses to the proposed assessment methodology for the Cultural Heritage Assessment Report

Responses to the proposed assessment methodology were received from Barraby Cultural Services (BCS), Duncan Falk Consultancy (DFC), Murra Bidgee Mullangari Aboriginal Corporation (MBMAC), Muragadi Heritage Indigenous Corporation (Muragadi), Tungai Tonghi, Woronora Plateau Gundangara Elders Council (WPGEC), and Yurrandaali Cultural Services (Yurrandaali).

BCS stated that they supported the proposed assessment methodology for the project (email dated 22/08/2018).

DFC stated they had read and reviewed the methodology and endorsed the proposed approach (email/letter dated 28/08/2018).

MBMAC expressed support for the recommendations in the assessment methodology (email dated 21/08/2018).

Muragadi stated they had reviewed the project information and proposed methodology and endorsed the proposed approach (email dated 21/08/2018).

Tungai Tonghi affirmed their interest in the project (email dated 23/08/2018).

WPGEC advised they had received the methodology (email dated 20/08/2018) and asked for further detail regarding the test excavation program (specific number of test pits and size of the test areas). Dr Matthew Kelleher (KNC) responded via phone call on 27/08/2018 to confirm the location of test areas and identified sensitive landforms, and discuss the amount of test squares estimated to be required to sample these. WPGEC agreed with the proposed approach.

Yurrandaali stated that they supported the proposed methodology (22/08/2018).

2.4 Review of draft CHAR

The draft CHAR was provided to stakeholders with an invitation to review and provide comment. Stakeholders were invited to comment on the Aboriginal cultural significance of the study area and the identified sites, along with the management recommendations presented in the report. A 30 day review and comment period was provided.

Comments and information received from stakeholders during this period are attached in full in Appendix C and summarised below.

2.5 Stakeholder responses to draft CHAR

Responses to the draft CHAR were received from Barraby Cultural Services (BCS), Duncan Falk Consulting (DFC), Guunamaa Dreamin Sites and Surveying (GDSS), Leanne Tungai, Murra Bidgee Mullangari Aboriginal Corporation (MBMAC), Muragadi Heritage Indigenous Corporation (Muragadi), Merrigarn Indigenous Corporation (Merrigarn), Yurrandaali Cultural Services (Yurrandaali), Woronora Plateau Gundangara Elders Council (WPGEC) and Illawarra Local Aboriginal Land Council (ILALC).

BCS acknowledged receipt of the draft CHAR but did not provide any further comment (email dated 28/01/2019).

DFC stated they had reviewed the draft CHAR and agreed with the proposed salvage. DFC also noted they supported the proposed two-stage salvage approach, in order to identify the best locations for open area salvage (email dated 26/01/2019).

GDSS acknowledged receipt of the draft CHAR and expressed their interest in being involved in the proposed salvage excavation fieldwork at the sites (email dated 25/01/2019).

Leanne Tungai acknowledged receipt of the draft CHAR and stated that she would like to be involved in future work on this project (email dated 26/01/2019). No further comment was provided during the review period.

MBMAC stated they had read the draft CHAR and agreed with the recommendations (email dated 25/01/2019).

Muragadi stated they agreed with the recommendations made by KNC (email dated 25/01/2019).

Merrigarn also stated they had reviewed the draft CHAR and agreed with the recommendations (email dated 25/01/2019).

Yurrandaali acknowledged receipt of the draft CHAR but did not provide any further comment (email dated 28/01/2019).

WPGEC reconfirm the identified archaeological value of the project area; however expressed opposition to the proposed development on several grounds (email/letter dated 25/02/2019), noting that the property is significant for several reasons:

1. WPGEC believe the site is “a rare undisturbed estuary”.

Response: While the site exhibits archaeological value it is not an undisturbed environment. The project area is largely cleared of trees, used for agricultural activity and filled in low lying areas (Stage 5A). The tree clearing and agricultural activities have resulted in pockets of intense disturbance (holes in the ground) and contributed to a low intensity blanket of disturbance (c.25cm deep) over the majority of the land. Archaeology remaining between the pockets of disturbance and beneath the agricultural layer displays an intactness of information, but it is not an undisturbed environment.

2. WPGEC state the “intactness” and “distribution of artefacts clearly show that occupation and activities at this site occurred during a prolonged period of time and on a repeated basis”. Furthermore, WPGEC state that the information from the test excavation “may suffice for the purposes of understanding and managing sites in similar estuarine environments”.

Response: The current level of archaeological assessment, in accordance with the OEH Code of Practice, identifies the archaeological significance of the site. Much of that significance resides in the information the site offers rather than any inherent value. Mitigation of the site will assist in unlocking the site’s scientific values. No chronological information exists for the site, thus it is not possible to determine the length of occupation or if occupation extended over multiple events. Obtaining a chronology for the archaeology is an important part of the proposed mitigation and would add considerable value to understanding the region’s archaeology. The information gained from salvage excavation will directly assist in managing similar sand environments because it will show if sand bodies are maintaining longer term archaeological records or are they simply single events representing a sand erosion cycle – old sand and any associated heritage being washed away and then replaced by new sand and heritage.

3. WPGEC link the location of a massacre site south of the project area to the current project area.

Response: The Dunmore Lake Sands Project has no direct or indirect connection to the massacre site located loosely on the Minnamurra River. The proposed operations will not impact the massacre site. The historic massacre is an important event in Aboriginal history, however the archaeology of the project area shows no connection to the massacre event.

4. WPGEC state the project area has a “high potential of containing burials”.

Response: Aboriginal burials may exist anywhere given the correct conditions. The project area is no more or less likely than other similar environment to contain burials. A procedure for human remains is included in section 11 of the CHAR. The archaeological assessment and test excavation program undertaken for the Dunmore Lake Sands Project identified no indication that Aboriginal burials exist on the property.

The ILALC objected to the proposal because the impacted Aboriginal heritage sites represent “very high cultural significance” (letter dated 01/03/2019).

1. ILALC state the project area as well as the wider Minnamurra River landscape has high cultural value distinct from scientific value.

Response: the specific project area exhibits a high level of archaeological significance; however specific cultural values linked specifically to the project area have not been identified. Intangible cultural values are omnipresent within the wider Minnamurra River landscape; however these values are not solely tied to the objects nor any specific tangible/intangible features within the project area.

2. ILALC object to the proposed mitigation measures as sufficient information was obtained by the test excavation program and further acquisition of further information is “obsolete”.

Response: Prior to the completion of the Dunmore Lakes Sand archaeological investigation no Aboriginal objects were recorded in the project area. The connection between coastal barrier geology and past Aboriginal cultural perceptions can be visibly seen in the archaeological record. The Dunmore Lakes Sand project reaffirms acknowledged Aboriginal values for the Minnamurra River, but importantly it represents a vanguard in the progressive understanding of past perceptions. Current levels of research fully conclude that Aboriginal people occupied the area, but this is only the beginning of the story. Further understanding of when, why and how Aboriginal people utilised the Minnamurra River area will deepen the connection between the past and the present. Information to date allows for a statement on the presence and absence of Aboriginal occupation, but the unfolding of the Aboriginal cosmological story requires substantially more information. The Dunmore Lakes Sand project is an opportunity to bring to light the complexity of the Aboriginal past – for example no midden material was uncovered during the test program suggesting it either did not survive raising questions regarding the intactness of the deposit or perhaps midden was never present suggesting an unusual relationship with adjacent coastal resources. This then leads to questions regarding how coastal barrier systems maintain Aboriginal information – is the deposit in flux, constantly changing through time or is it more a stable time capsule. The collection of a foundational sample through the proposed mitigation salvage will therefore increase the ability to manage these important deposits in the wider area. For example it is unknown if simply leaving the deposit alone will actually result in conservation or a slow deterioration.

3. ILALC identify the Burra Charter as an appropriate means for making recommendations.

Response: The assessment of Aboriginal archaeological and cultural heritage was undertaken in accordance with the NSW Department of Planning and Environment and OEH requirements as identified in section 1.2 of this report. OEH incorporates the principles and logic of the Burra Charter into its guidelines and documents. The assessment of Dunmore Lakes Sand complies with the OEH requirements.

2.6 Ongoing consultation

Boral values Aboriginal community consultation and is committed to ongoing consultation with Registered Aboriginal Stakeholders for the Dunmore Lakes Sand Project.

2.7 Aboriginal cultural values

It has been identified during the consultation process that the wider study area has cultural heritage value to the local Aboriginal community. Some of the Aboriginal cultural heritage values expressed by stakeholders include:

- strong association with the land
- responsibility to look after the land, including the heritage sites, plants and animals, creeks and the land itself
- scarred trees
- artefact sites and middens
- creek lines and rivers, especially major landscape features such as the Minnamurra River, its tributaries and floodplains
- indigenous plants and animals
- general concern for burials, as their locations are not always known and they can be found anywhere. Consultation has identified that burials are known to the Aboriginal community along the banks of the Minnamurra River to the south of the study area (James Davis, phone call 16/11/2018).
- connection to more recent (post-European) Aboriginal history including a massacre site on the Minnamurra River recently acknowledged by Kiama Council (see section 3.3).

Aboriginal cultural values and knowledge of the area have been provided by registered stakeholders throughout the consultation process and are summarised below.

Darug Land Observations (DLO) noted during registration that members of the contemporary Aboriginal community retained strong story, song lines, oral history and continued contact with the area (letter/email dated 12/07/2018).

Guunamaa Dreamin Sites and Surveying (GDSS) also noted the presence of songlines in the area as well as other known Aboriginal sites including scarred trees (email dated 12/07/2018).

Woronora Plateau Gundagara Elders Council (WPGEC) advised that the area held high value and cultural significance for a number of reasons, including its value as forming part of a “rare undisturbed estuary environment” within the wider Illawarra region (letter and email dated 25/02/2019). The intact archaeology of the sites demonstrated “continuous occupation with evidence of a lengthy and maintained connection to this land”. WPGEC also noted the presence of the recorded massacre site on the Minnamurra River approximately 500 metres to the south, and noted that the study area’s proximity to this site meant it should be afforded appropriate respect. In addition, WPGEC noted a high potential for Aboriginal burials, both older and more recent instances given the sandy deposit, proximity to water and the known massacre site.

3 Description of the Area

3.1 Landform, geology and soil landscapes

The study area is located within the Illawarra subregion of the Sydney Basin. It is within the Coastal Plain physiographic region that lies between the Illawarra Escarpment and the sea. The Sydney Basin is a large geological feature stretching from Batemans Bay in the south to Newcastle in the north and Lithgow in the west. The basin formed between the Permian and Triassic when sedimentary rocks were created by the deposition of sediment from fluctuating marine advance and regression onto older basement rocks of the Lachlan Fold Belt and Late Carboniferous volcanoclastic sediments (Mayne et al. 1974). Earth movements between 180 and 200 million years ago within the southern side of the basin forced the layers of sedimentary and volcanic rock upwards (Young 1980a). The combination of erosion and the downward movement of debris on the southern side of the basin produced the Illawarra Escarpment which stretches from the Royal National Park in the north to Berry in the south and overlooks the Illawarra Coastal Plain.

The basal geology of the study area consists of Bumbo Latite, a member of the Gerringong volcanic facies and an intrusive feature of the Budgong Sandstone Formation (Figure 3). Bumbo Latite is a fine grained basalt-like aphanitic to porphyritic latite which formed during the Permian Period (298 – 252 million years ago) (Bowman 1974: 37). The latite ranges from mid grey to black in colour with commonly occurring columnar jointing, breccia zones and inclusions of metamorphosed sandstones. In areas of the thickest development, the latite occurs in three flows that are separated by breccia zones and discontinuous sediment. Bumbo Latite is porphyric basalt with a fine-grained groundmass varying from mid grey to black in colour.

Quaternary deposition within the Coastal Plain has mainly taken place within coastal barrier, estuarine plain and alluvial plain settings. The rising sea within the coastal lowland developed into estuaries with tidal channels and flats along margins. As the water level rose, the flooded area was fringed by freshwater marshes in which peat bog could develop. These sedimentary environments form a dynamic system that can shift landward or seaward, with superimposition of one type of sediment over another in response to a number of factors including the rate of sea level rise, sediment supply and accumulation space. This dynamic character implies that at any time during the Holocene all different types of sediments could have existed next to one another sometimes even over short distances (Bailey *et al.* 2017: 227). The New South Wales Coastal Geology Maps Series has produced map coverage of unconsolidated sedimentary deposits in the coastal areas of NSW. These deposits have been classified into three depositional systems, each of which is distinguished by a particular range of sediment types, processes and geomorphic features. Most of the units are also differentiated by age as Holocene (deposited within the last 12,000 years during the post-glacial marine transgression and rising sea level), or Pleistocene (deposited prior to this time, during low sea levels). According to this mapping, the study area lies within three Quaternary depositional units (Figure 3):

- Qhef (Holocene tidal-delta flat) – northern part of Stage 5A within this estuarine plain system, characterised by marine sand, silt, clay, shell and gravel;
- Qhbf (Holocene backbarrier flat) – southern parts of Stage 5A within this coastal barrier system, characterised by marine sand, silt, clay, gravel and shell;
- Qhbr (Holocene beach ridge and associated strandplain) – Stage 5B within this coastal barrier system, characterised by marine sand, shell and gravel.

Estuarine depositional environments occur within the transitional zone between alluvial and coastal barrier environments. Deposition takes place in and around enclosed to partially enclosed water bodies of brackish to marine salinity, generally under regular to intermittent tidal influence. Tidal-delta flats (Qhef - northern section of Stage 5A) represent older, vegetated areas that are generally mantled by swamps or palaeochannels. They may grade into backbarrier flats (Qhbf), often beneath freshwater swamp cover.

Coastal barriers occur within the most seaward parts of the coastal plain. Beach ridges generally occur in a subparallel series to form a beach-ridge plain (Qhbr - Stage 5B study area). The ridges represent successive periods of beach and frontal dune accretion along coastal sectors experiencing net accretion over geological time scales.

Areas of low elevation and relief occupying the landward portions of barrier systems are termed backbarrier flats (Qhbf - southern section of Stage 5A). They are considered to be formed through storm washover deposition in the initial stages of barrier formation. Such processes become inactive over time due to the growth of dunes and/or increase in the width of the barrier system through seaward progradation. Thus, backbarrier flats are generally relict features unrelated to contemporary processes.

The study area lies in its entirety within the Mangrove Creek Soil Landscape (Figure 3) as classified by Hazelton (1992). These soils are Holocene sediments that occur within four different shore zones each with a different drainage and inundation pattern. At the lowest elevation is the mudflat zone, which is regularly inundated except during low tide; with increasing elevation are mangrove zones inundated only during high tide; the saltmarsh zone inundated only

during spring flooding; and finally littoral rain forest that is rarely flooded and has interrupted or absent drainage. Local relief is <3 metres and slopes <3%. Mangrove Creek soils are deep Siliceous Sands and Calcareous Sands on mangrove flats, and Humic Gley soils on salt marshes. They consist of up to 30 centimetres of organic mottled brown silty loam occurring as topsoil (Horizon A), overlying <50 centimetres of organic black sandy loam, and <100 centimetres of shelly greyish yellow sand occurring as subsoil (Hazelton 1992: 131-133). Boundaries between soil layers are gradual to diffuse. The soil landscape is abundant in organic fibrous matter and its erodibility is generally very low.

Analysis of European land use and its subsequent effect on regional soils has identified that while evidence for erosion in the form of gullying and sheet erosion is widespread, overall soil erosion in the Illawarra region is generally low (Young 1980b). This relates to the biased European selection of volcanic/sandstone geological contexts (and subsequent soil landscape development) for agriculture and use as pasture. Land on coastal sands was largely ignored for farming due to the low fertility of the sandy soils, but was used for grazing. As intensive grazing requires a stable soil matrix to support good grass cover, these areas have generally been well maintained in order to facilitate their use as pasture.

Topographically, the study area is located across floodplain and estuarine landforms associated with the Minnamurra River and its estuary (Figure 4). Stage 5A and Stage 5B are dissected by an extensive ridgeline running north-east towards the floodplain. The southern section of Stage 5A is located to the west of the Minnamurra River on a backbarrier flat between the saline swamp and a tidal flat. The northern section of Stage 5A is situated within the tidal flat landform which extends along Rocklow Creek, a major tributary to the Minnamurra River. Stage 5B is within a beach ridge landform, located to the south of the ridgeline, and west and north of the Minnamurra River.

Hydrology around the study area is characterised by the presence of the Minnamurra River and its estuary. Rocklow Creek, one of its major tributaries is located to the north of the study area. Saline water from the tidal influence of the Minnamurra River normally reaches the section of Rocklow Creek east of the Illawarra Railway Line and can extend into the section west of the Princes Highway, within the Stage 5A study area. Several small drainage lines run west-east and empty into the Minnamurra River, with one of these running along the northern boundary of the Stage 5B study area. One small dam is located to the north of the Stage 5B area and is associated with this drainage line.

Boral completed a drilling program in 2016 in order to investigate the presence and viability of the sand resource within Stages 5A and 5B. Total depth of sediments varied according to sand presence/absence, depth and quantity and was between 6.4 and 27 metres. The general soil profile within Stage 5B consisted of sandy topsoil and weathered sand between 2 and 3.5 metres depth, overlying between 2.5 and 9 metres of fresh (unweathered) tsunami-deposited medium and fine sands with varying shell content. Fresh sands overlie fluvial sand deposits, but are separated by a small layer of clay deposit. The underlying base rock is latite, which sits closer to the surface or outcrops within the areas adjacent to the hill, to the north of the Stage 5B area. The northern section of the Stage 5A area that lies within the tidal flat, revealed weathered topsoil sand deposit to 0.75 metres, overlying 5 metres of fresh unweathered sand. The southern sections of the Stage 5A area within the backbarrier flat revealed topsoil of weathered sand between 4 and 4.5 metres depth, overlying between 1 and 3 metres of fresh, tsunami-deposited unweathered sand. These fresh sands overlie clayey sand, clay and latite base rock.

The geology, soil and landforms of the study area influence the presence of Aboriginal archaeological features. Coastal and estuarine environments within the study area would have made it an attractive locale for past Aboriginal people. Estuarine, swamp/wetland and the littoral and marine resources of the coast were all available, along with fresh water from smaller streams. The variety of habitats would also have encouraged a diverse population of fauna. Many fish and crustacean species breed in estuaries and then spend their adult lives in the sea. This makes estuaries a good feeding ground for a number of wading birds who feed on the juveniles. Raw materials suitable for tool-making are available from surrounding geologies and may have been sourced directly from outcrops or as stream and river cobbles transported to the coast from deposits further inland. The soils derived from the volcanic geology of the study area also supported varied native vegetation which was utilised by past Aboriginal people as a resource.

The adjacent catchment areas of Frazers Creek and Rocklow Creek would also have offered important resources. These would have differed significantly during the Holocene when the flood plains and eastern portion of Rocklow Creek formed an estuary. Topographically, elevated and well-drained portions of the study area would have been a preferable camping place surrounded by a variety of resources.

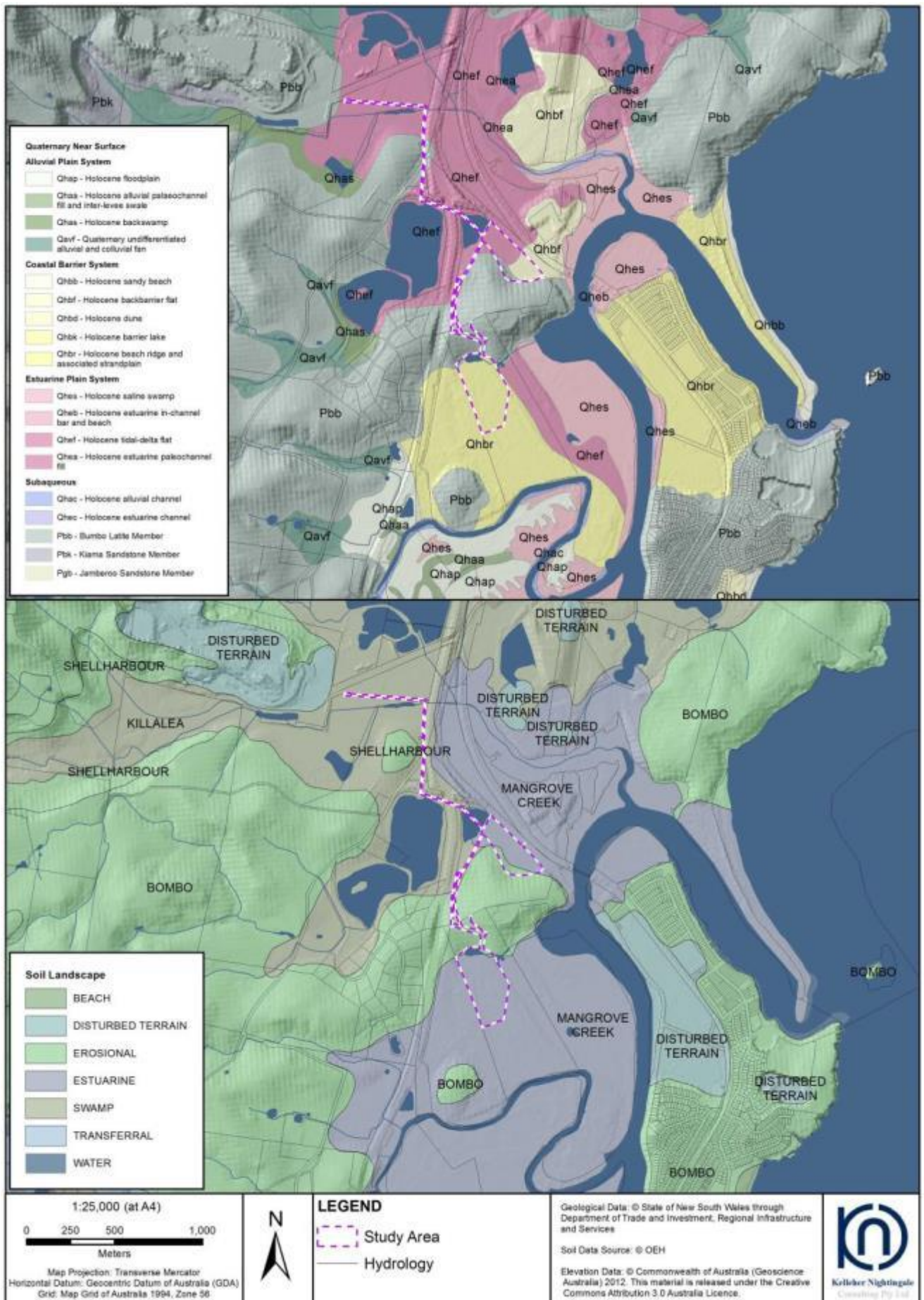


Figure 3. Geology and soil landscapes within the study area

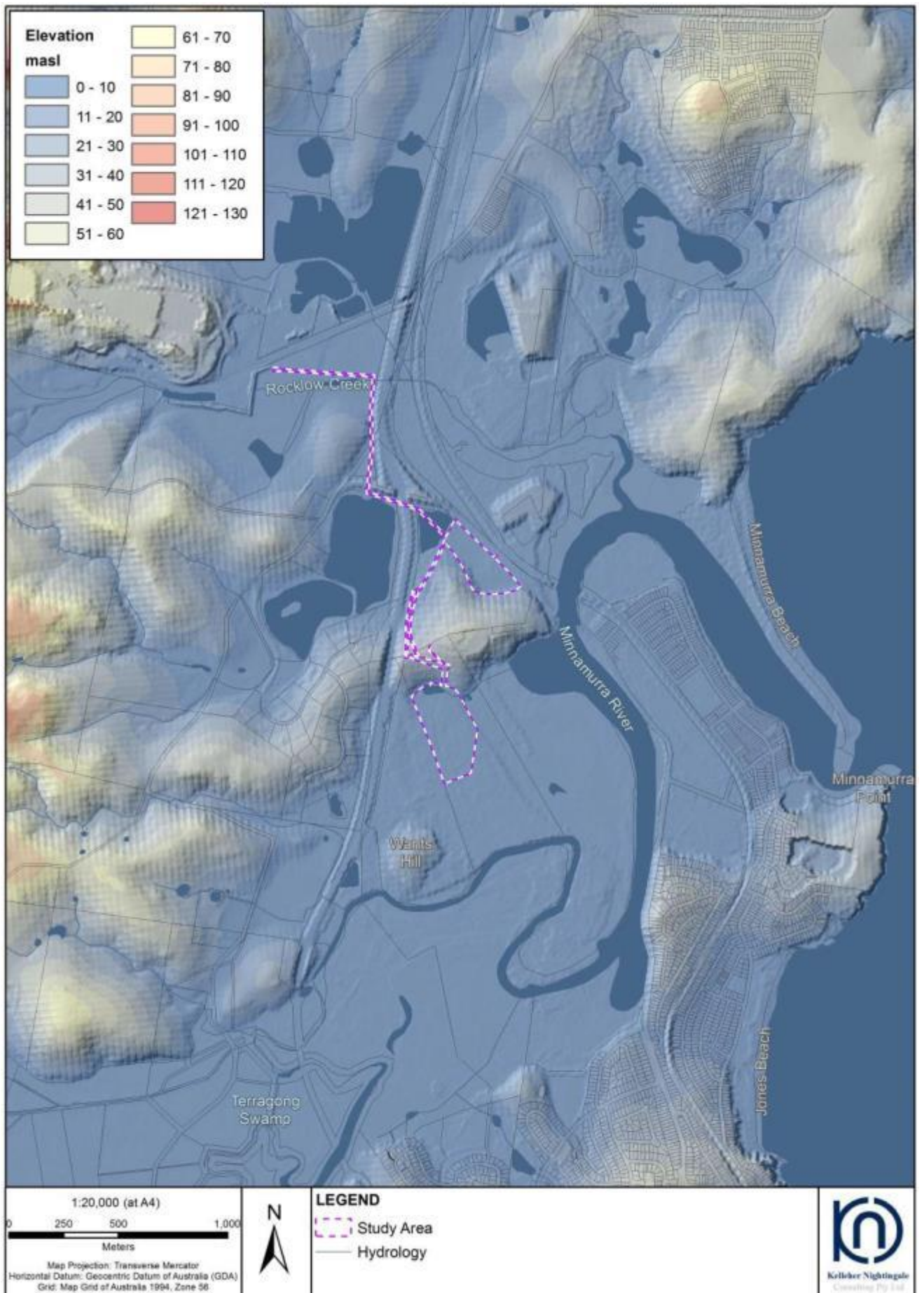


Figure 4. Topography of the study area.

3.2 Vegetation and land use

The study area is located within the Lake Illawarra Alluvial Plains as mapped by NSW Department of Conservation and Climate Change (DECC) in 2002 (Mitchell Landscape). Most of the plains are cleared, but originally had Forest Gum (*Eucalyptus tereticornis*), Woollybutt (*E. longifolia*), White Stringybark (*E. globoidea*), Thin-leaved Stringybark (*E. eugenoides*) and extensive stands of Swamp Oak (*Casuarina glauca*), Prickly Paperbark (*Melaleuca styphelioides*) and decorative paperbark (*Melaleuca sp.*) on brackish wet ground near creeks. River Oak (*Casuarina cunninghamiana*) is found close to fresh water streams. The understorey varies and contains either a dense ground layer containing grasses, herbs and sedges to a height of 1 metre; or a shrubby layer, sometimes including plants such as *Pittosporum* species to a height of 2 metres.

Much of the vegetation on the coastal plain of the Illawarra and South Coast region has been cleared, fragmented or heavily modified. At least 75% of the ecological community has been cleared and it is still subject to clearing due to ongoing development of the region. Other impacts stem from stock grazing, changes to fire regimes and recreational activities. A small area in the south-western corner of Stage 5B contains thinned sand forest vegetation.

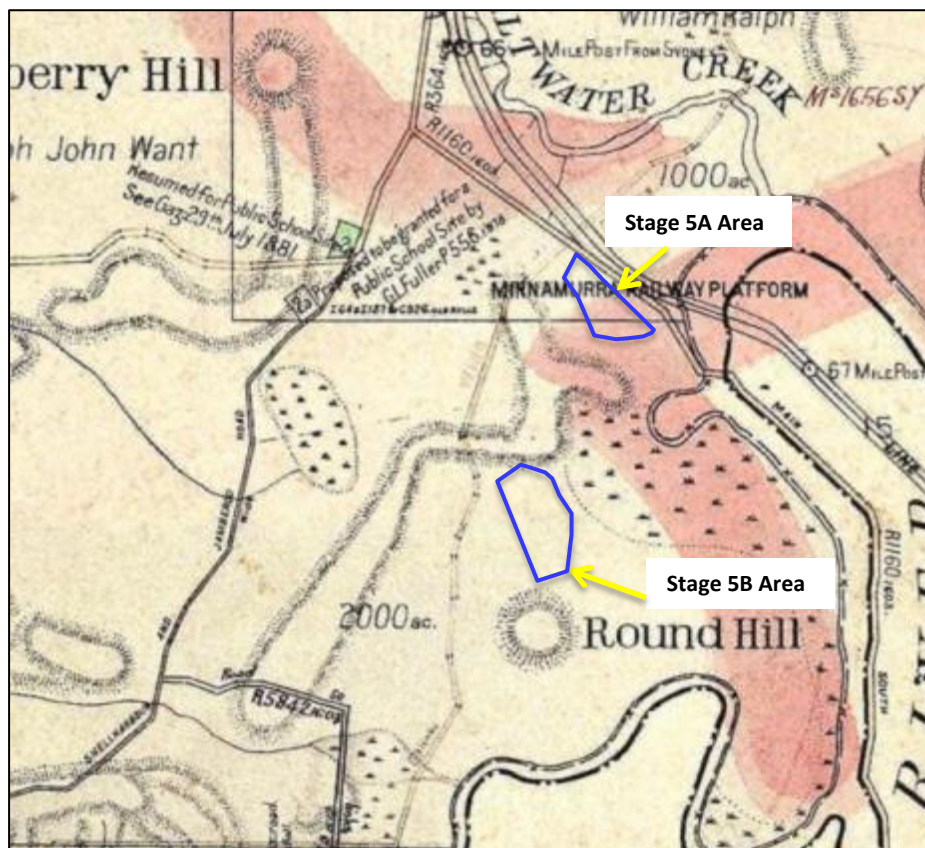


Plate 1. Parish of Terragong, County of Camden Map, 1895. Courtesy of Land and Water Conservation 138329. (approximate locations of Stage 5A and 5B extraction area outlined in blue).

Historical land use within the region included the cultivation of crops, grazing cattle and quarrying. Review of the historical parish maps revealed that the study area has been through very limited land modifications in the last 200 years (Plate 1). Extensive swamps are mapped to the east of the Stage 5B area, adjacent to the Minnamurra River. Major disturbances within the study area surroundings are associated with the construction of 'Dunmore House' and its outbuildings and access roads. It is located on the prominent ridgeline between Stage 5A and Stage 5B. Past land use activities within areas are limited to land clearance and installation of fences and informal access paths. Aerial photography dated from 1948 revealed that the majority of native vegetation had already been extensively cleared. The entire Stage 5A area was cleared with only a few remnant trees; Stage 5B area showed tree cover south of the small dam. These land use practices would have removed the majority of mature native trees.

Removal of trees would also have caused disturbance of surface soil layers, causing mixing of topsoil sand deposits. The drainage line located to the north of Stage 5B has not gone through any major modifications. Both areas are currently covered in short pasture grass, with scattered trees present to the south of Stage 5B. A dam located to the north of Stage 5B is most likely natural and associated with a small drainage line flowing west-east to the Minnamurra River. Currently, the study area is used for cattle pasture. The study area contains numerous dirt tracks used for both vehicle and pedestrian access.

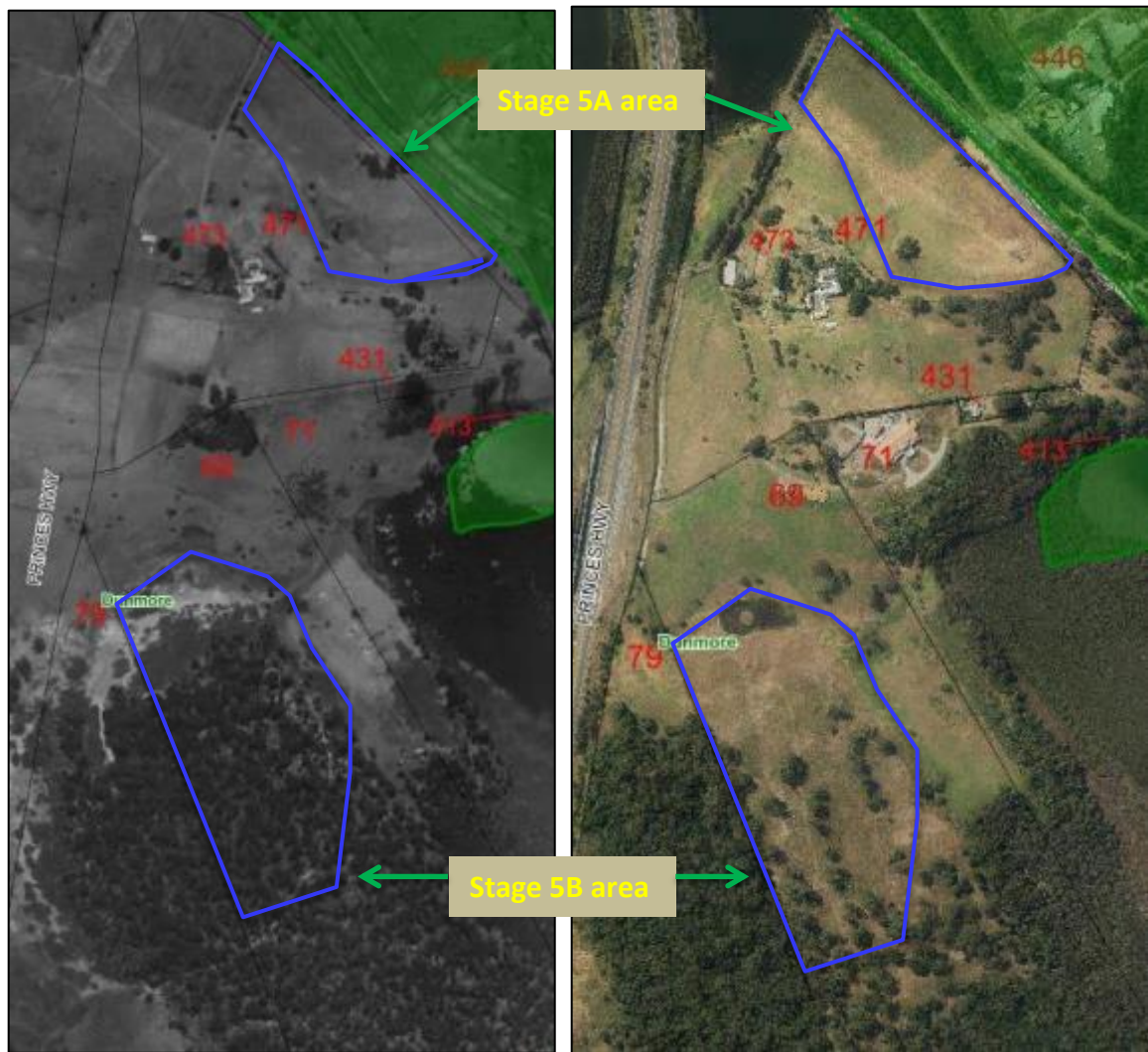


Plate 2. Comparison aerials of Stage 5A and 5B: 1948 and 2016, courtesy of Shellharbour City Council (approximate locations of Stage 5A and 5B extraction areas outlined in blue)

3.3 Ethnohistoric context

The study area lies within a landscape which was important to, and intensively used by, past Aboriginal people. Aboriginal people living in the Illawarra spoke various dialects of the language known as Tharawal (also spelled Dharawal, Thurawal, Turuwul, Darawal etc.), a local word for cabbage palm. It was spoken and understood from Botany Bay and Sydney in the north, west towards the Blue Mountains, Moss Vale and Goulburn, and south to the Shoalhaven River and Jervis Bay (DEC 2005: 6). The Tharawal language was largely associated with coastal groups however the boundaries of “languages or dialects can only be indicative at best”, chiefly because groups of people and their language do not move around based on straight lines dividing language groups (Attenbrow 2002:34-35). The Tharawal people living in the vicinity of the study area were known as the Wodi Wodi (also spelled Wadi Wadi), whose traditional oral histories tell of their arrival at Lake Illawarra by canoe, long ago when the Ancestors were animals (DEC 2005:6). Traditional stories tell how they brought the Dharawal cabbage tree palm with them from the north and were named for it (DEC 2005:6).

Early European accounts indicate that the Wodi Wodi lived as a highly mobile and dispersed population, primarily in small territorial clans and local clans of extended family groups, forming larger bands through social and cultural links including marriage and communal participation in subsistence activities. The Illawarra and wider NSW South Coast offered many lakes, estuaries, sandy beaches and intertidal zones with a diversity and abundance of resources for the local people to use. In the Illawarra region, local Aboriginal people were identified as fresh or salt water people due to their occupation of particular marine or estuarine landscapes and their use of the natural resources found in these environments. They would have access to a wide range of avian, terrestrial and marine fauna; repeated firing of the vegetation would have opened up foliage allowing ease of access through and between different eco zones.

European observers noted that the large water bodies such as Lake Illawarra were important fishing areas for past Aboriginal people and were fished from canoes used bone hooks and lines or specially constructed spears (DEC 2005:10). Historical accounts also recorded the use of the many creeks of the area for fishing using spears and fish traps made of loosely woven plant fibre and sticks. Spears, pit traps and snares were used to hunt wallabies in the forested hinterland away from the coast, while possums were smoked out of hollow trees and logs (DEC 2005: 12). Reptiles were hunted in the open forests along the escarpment, and wild honey collected from native bee hives. Plant resources, as well as providing important foodstuffs, were also used to construct spears, digging sticks, boomerangs and other tools. Forest trees yielded bark strips suitable for canoes and shelters, as well as fibres for string and rope. Plants from the swamps on the coastal plain were particularly used for fish nets and string bag-making. Other plants provided fish poison, dyes and paints.

Following the first land grants in the Illawarra from the early nineteenth century, Aboriginal land use and resources were depleted by the introduction of livestock, exotic plants, tree clearing and fencing. Land grants were mainly given fronting fresh water creeks or rivers, which limited Aboriginal people from obtaining the economic resources concentrated around these water bodies. They were pushed to the fringes of their Country, mainly towards the coast. In addition to this, introduction of exotic diseases including smallpox further decreased the number of local Aboriginal people in the area, with an estimated half the population affected (Organ 1990:5). Conflict between the European settlers and local Aboriginal people became more common as pressure on the traditional owners increased, with numerous instances of Aboriginal people taking crops and livestock from settlers as their own traditional economic resources were subsumed (DEC 2005:18-19). This often led to violent reprisals from settlers, with a number of Aboriginal people shot or mutilated in retaliation for the ‘thefts’ or during other disputes. Settlers rarely faced serious punishment for their treatment of Aboriginal people. One such instance was recorded along the Minnamurra River south of the study area.

In October 1818 Lieutenant Weston, land owner at Dapto and Cornelius O’Brien, formerly a stockman at Sandon Point and now the overseer of a property at Yallah, organised a group of seven labourers and convicts. Unusually armed with muskets, cutlasses and pikes, they headed to Kiama supposedly to fetch two muskets lent to a group of people living on the Minnamurra River. According to Young Bundle, who was long trusted by the British, the posse killed all the people at the camp. The attackers admitted only to wounding a boy in self-defence. After a sharp letter of protest from Charles Throsby to Governor Macquarie, the murders were investigated by D’Arcy Wentworth, the Principal Superintendent of Police, along with other magistrates. They took no action against the killers despite a letter from Governor Macquarie to D’Arcy Wentworth expressing his “surprise, regret and displeasure” at their findings. (Donaldson et al 2017:13).

Kiama Council formally acknowledged this massacre in October 2018 at a public ceremony and acknowledgement of the event will form part of interpretation strategies for the new Minnamurra Boardwalk project on the opposite side of the river, with a permanent plaque to be laid. Contemporary Aboriginal people maintain a strong connection to the area and retain both cultural and historical knowledge of its settlement history. The value of the general area to both the past and the present Aboriginal community is underscored by the ongoing cultural connection expressed by the contemporary Aboriginal community, as evidenced during the formal consultation process.

4 Archaeological Context

4.1 Heritage register searches

The Aboriginal Heritage Information Management System (AHIMS) is a database operated by OEH, regulated under section 90Q of the *National Parks and Wildlife Act 1974*. AHIMS contains information and records related to registered Aboriginal archaeological sites (Aboriginal objects, as defined under the Act) and declared Aboriginal places (as defined under the Act) in NSW.

A search of AHIMS was conducted on 20 April 2018 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area (AHIMS Client Service ID: 340468). The search results are attached as Appendix D. Subsequently recorded sites within the study area were registered as part of the current assessment following test excavation (see section 7.4).

The AHIMS Web Service database search was conducted within the following coordinates (GDA, Zone 56):

Eastings:	300800 to 304650
Northings:	6164300 to 6169300
Buffer:	200 metres (search area included an extensive buffer)

The AHIMS search results revealed 29 Aboriginal sites had been recorded within the search area (Figure 5). No Aboriginal places had been declared within the search area. Site features ('site types') are listed in the table below.

Table 2. Registered Aboriginal sites around the study area (AHIMS results)

Site Context	Site Features (Site Type)	Total	%
Open	Artefact	9	31.1
	Shell; Artefact (Midden)	18	62.1
	Shell	1	3.4
	Restricted Site*	1	3.4
Total		29	100

*Discussions were held with the AHIMS registrar regarding the location of the restricted site. It was confirmed that this site is not located within the vicinity of the study area (David Gordon, personal communication, 18/12/2018).

Other sources of information including heritage registers and lists were also searched for known Aboriginal heritage in the vicinity of the study area. These included:

- Shellharbour Local Environmental Plan 2013
- Kiama Local Environmental Plan 2011
- State Heritage Register and State Heritage Inventory
- Commonwealth Heritage List
- National Heritage List
- Australian Heritage Database
- Australian Heritage Places Inventory
- Register of the National Estate (non-statutory list).

No Aboriginal archaeological sites or Aboriginal heritage items listed on AHIMS or the heritage lists were situated within the study area.

The location of registered Aboriginal sites within the search area is shown on Figure 5.



Figure 5. Registered Aboriginal sites near the study area (AHIMS results)

4.2 Previous investigations around the study area

A number of Aboriginal archaeological surveys and assessments have been undertaken associated with the existing Dunmore Hard Rock Quarry, located to the north west of the study area. These have included a 2003 survey and assessment of Lot 1 DP 571406, Dunmore Hard Rock Quarry (Australian Archaeological Survey Consultants Pty Ltd (AASC) 2003); 2003 and 2004 survey and assessment as part of the DA for the increase in production at the quarry (Robert Paton Archaeological Studies Pty Ltd 2003, R.W. Corkery & Company Pty Limited 2003, AASC 2004); and in 2008 survey and assessment as part of the Statement of Environmental Effects for the proposed Hard Rock Quarry extension (AASC in R.W. Corkery & Company Pty Limited 2008). These previous assessments identified one open artefact scatter (site DQ1; AHIMS 52-2-1791) and one scarred tree (site DQ2; AHIMS 52-5-0300) within the existing Dunmore Hard Rock Quarry area.

KNC has also undertaken archaeological investigations for the Dunmore Hard Rock Quarry (KNC 2017). Three test excavation areas were identified within the assessment area on a south east running spurline in proximity to a natural reservoir. Soils consisted of erosional Bombo Soil Landscape occurring as sandy clay loams, underlain by Bombo Latite. Test excavations recovered a total of 86 artefacts. Raw materials included primarily fine grained siliceous stone, classified as agate, chalcedony and chert, as well as smaller quantities of quartz, silicified tuff, mudstone, unidentified fine grained siliceous, jasper, unidentified medium grained siliceous, igneous, petrified wood and quartzite. Artefact types included a hatchet/anvil fragment which had been recycled for use as a core, modified cobbles, whole flakes and a backed artefact. The three areas were subsequently identified as three artefact scatter sites (Croome West AFT 1, Croome West AFT 2 and Croome West AFT 3). Croome West AFT 1 and Croome West AFT 2 were identified as having moderate archaeological significance and have subsequently been salvaged in accordance with mitigation measures. Croome West AFT 3 was assessed as having low archaeological significance and no further assessment was deemed necessary.

Salvage excavations were completed by KNC in 2018 of two artefact scatter sites, Croome West AFT 1 (CW1) and Croome West AFT 2 (CW2). The assemblages consisted of a total of 1,188 artefacts from both CW1 and CW2. They were mostly comprised of flakes, with limited on site manufacturing, as evidenced by the limited number of cores and mainly low artefact density across CW2. The generally low frequency of cores and slightly higher frequency of modified flakes (including 21 backed artefacts) all trended towards a non-utilitarian use of the hill crest. Cultural activity on the site was likely to have been for a specific cultural practice, with lithic resources carried in from the surrounding area or even coastal gravels to the east.

Closer to the current study area, Sullivan completed an assessment in 1977 of an area adjacent to the Minnamurra River, where she identified two concentrations of archaeological material. A dense scatter of artefacts and shell was identified over an area of 5 square metres on the margins of a large pond resulting from sand mining, on a Quaternary alluvial plain, approximately 500 metres south-west of the current study area. The site was recorded as Minnamurra Glengowrie (AHIMS 52-5-0072) (Figure 5). At another location augering indicated that stratified deposit 10-20 centimetres thick was present at 20 centimetres depth. This second site was identified within the coastal beach ridge landform, at the bottom of Wants Hill. The AHIMS site coordinate places it approximately 100 metres south of the study area however the description on the site card indicates it is located further to the south west of Wants Hill, closer to the Princes Highway. It was recorded as artefact scatter Minnamurra (AHIMS 52-5-0117) (Figure 5). Identified cultural material included scattered shell, charcoal, burnt bone fragments and flaked stone material exposed and disturbed by local sand mining. Considering the proximity to estuarine resources, it was noted that there was a high likelihood that further Aboriginal archaeological material could occur within the area, particularly around the base of the hill to the north and east.

An archaeological survey as part of an EIS was completed by K. Gollan within the Tabbagong property in 1983. One Aboriginal shell midden and artefact scatter site was identified 10 metres from the wetland margin north of the Minnamurra River, approximately 500 metres south-west of the current study area. The site was recorded as Tabbagong; Tabbagong 1 (AHIMS 52-5-0159), and consisted of shell material and fine grained siliceous stone artefacts located within an area of 20x30 metres and to 30 centimetres depth under 10 centimetres of organic cover. It was considered that good pasture grass was protecting the surface of the site and that there was no threat to the midden from erosion or traffic.

A survey for the Shellharbour Waste Disposal Depot at Dunmore, one kilometre north of the current study area identified one site, a remnant midden, that is recorded on the AHIMS register as two separate sites: Dunmore Midden Shellharbour Waste Disposal Dump (AHIMS 52-5-0201) and Dunmore Midden (AHIMS 52-5-0213) (Figure 5), 20 metres south of Rocklow Creek (Bonhomme 1985). The site covered an area of 25 square metres, on a flat area adjacent to the swamp on a Quaternary alluvium, extensively disturbed by sand mining. It has since been destroyed. No further archaeological sites were identified.

Previous research undertaken by Sullivan in 1982 on the south coast has shown that middens in the estuarine environments were usually located on elevated ground around the margins of the estuaries. Navin (1987) found that areas around Lake Illawarra contain sites on raised surfaces of older sediments above the inundation zones.

A number of other studies have been undertaken surrounding the study area with some interesting archaeological results. These have included identification of a series of Aboriginal sites (all artefact scatters) associated with lowland alluvial and former estuarine deposits.

Five open artefact scatter sites were recorded to west of the current study area during an archaeological assessment of a proposed development area at Dunmore (Navin 1989). The cluster of recordings was associated with an alluvial plain and wetlands overlying earlier estuarine sand deposits. Dunmore 1 (AHIMS 52-2-0251) was a small open artefact scatter identified on the edge of a ridge crest which formed a major boundary between the Minnamurra River and the wetlands associated with the lower reaches of Rocklow Creek. Five artefacts were identified including a scraper, flakes and a flaked piece of silcrete, fine grained siliceous material, rhyolite and chert. Shell fragments of Sydney cockle and southern mud oyster were also identified. The site had been disturbed by European land use practices including agriculture and road construction.

Dunmore 2 (AHIMS 52-2-0252) was a larger open artefact scatter identified on the eastern margins of the alluvial plain, at the base of a low ridge spur. Over 35 artefacts were identified across an area of approximately 60m x 40m, with exposed sections along a vehicle track containing artefacts at a depth of 30cm. The north western portion of the site was disturbed by road construction, erosion and sand mining but the majority of the site was considered likely to be intact. Artefacts included cores, choppers and retouched flakes, a scraper and numerous flakes and flake fragments. A wide range of raw materials was identified including rhyolite, silcrete, petrified wood, basalt and other igneous materials. Shell fragments of oyster, Sydney cockle and mud whelk were also identified at the site. The variation in artefact types and raw materials was considered reflective of a wide range of site activities.

Open artefact scatter site Dunmore 3 (AHIMS 52-2-0253) was identified less than 50 metres west of Stage 5A on the edge of a low terrace at the base of a north-running ridge spur, approximately 18 metres west of the Dunmore House boundary fence. The artefact scatter faced north and was located on the eastern margin of the alluvial lowland plain. Nineteen artefacts were exposed in the spoil of a cattle burial pit across a 10m x 7m area. Artefacts included a grey silcrete blade, red silcrete geometric microlith, red silcrete flaked piece, rhyolite blade, flakes of grey and red silcrete and fine grained volcanic flaked pieces, as well as alluvial basalt pebble manuports. It was considered that the site most likely had subsurface deposits in a largely undisturbed context. The site rests on a littoral slope representing a former estuarine foreshore line. The site extent is limited and directly tied into the topography; bounded by the mud flats to the north and west and steep gradients to the south and east. Because the site is spatially well defined and located outside of the study area no further investigation of the deposit was warranted.

Dunmore 4 (AHIMS 52-2-0254) was identified along the northern edge of a low dunal sand body, considered to be an eroded relic of a beach line from the area's estuarine or inlet phase. Twelve artefacts were identified across a recent exposure of the dune slope associated with tree removal works. Associated shell material included fragmented and weathered pieces of Sydney cockle, oyster and mud whelk species. Artefacts included flakes and flaked pieces of rhyolite, chert, silcrete and quartz. Fine grained volcanic pebbles and pebble pieces were also identified. The low density of artefactual material was considered to indicate a mostly subsurface site which had been exposed through disturbance. The site may have been destroyed during construction of the highway upgrade.

Dunmore 5 (AHIMS 52-2-0255) was identified approximately 150m south of Dunmore 4, on the same dunal sand body. A medium density scatter of 40 artefacts and three oyster shell fragments were identified in an exposure of approximately 25 x 25m. The site had been disturbed by construction of a carpark to the south, which had effectively levelled and truncated the dune deposit. Artefacts included large (>50mm) quartz flakes and fractured pebbles, a chalcedony flake, pebble manuports, rhyolite scraper, rhyolite flakes, petrified wood flaked pieces, silcrete and chert flakes and flaked pieces, fine grained siliceous flakes, volcanic flakes and fractured pebbles and a retouched fine grained siliceous flaked piece displaying platform preparation. Given the landform context, it was considered highly likely that intact archaeological subsurface deposit occurred within the dunal body between sites Dunmore 4 and Dunmore 5. Further archaeological investigation was recommended if impact to sites Dunmore 3, 4 and 5 could not be avoided.

Archaeological assessment of Aboriginal sites was completed by Silcox in 1990 for the proposed North Kiama Bypass between Dunmore and Bombo. Sections of the highway (currently Princes Highway A1) are located 100 metres west of the current study area. Survey resulted in re-location of three previously recorded Aboriginal sites (52-5-0251, 52-5-0253 and 52-5-0072), and identification of one new Aboriginal site and areas of archaeological potential. Site KB1 was identified at the east side of the sand mine pondage, directly opposite site 52-5-0072. The site consisted of a sparse scatter of shell fragments and two stone artefacts on the sloping banks of the sand mine pondage on 'Glengowrie'. It was considered that the site would be most likely impacted by the construction zone. KB1 is not registered on AHIMS. Two locations were identified as having potential for archaeological deposits: area KBx was located in the vicinity of site 52-5-0253 within the terrace; and area KBy was identified west of the Minnamurra River on a low ridge south of the pondage on 'Glengowrie'. These two areas were identified on the basis of previous research undertaken by Sullivan (1982) and Navin (1987) indicating that Aboriginal sites were likely to occur on toeslopes and elevated surfaces, such as terraces around the margins of estuaries and floodplains. Due to slope processes or to sediment

accumulation from floodplain dynamics, such sites may have been buried, and their existence could be established only through test excavations.

A test excavation on a remnant beach ridge at Dunmore north of the current study area recovered 939 stone artefacts from 19 of the 20 test pits (Navin Officer 2000). All test pits revealed a profile dominated by well-sorted sandy matrix, of probable Aeolian/beach origin. Small quantities of midden shell were recovered from seven pits. Artefact material was predominantly chert and silcrete (over 40%) with quartz, chalcedony and volcanic material comprising much of the rest of the assemblage, with very small amounts of jasper, quartzite, petrified wood, mudstone, limestone and porphyry and sandstone. The site has since been destroyed.

Mary Dallas identified shell midden and artefact site Minnamurra River Shell Midden 1 (MR1) (AHIMS 52-5-0526), located approximately 180 metres east of the current study area. The Aboriginal cultural material was exposed within an area of 20x30 square metres, with the densest shell component over 20x7 square metres. Shell species included mature edible individuals of primarily Hercules Whelk (*Pyrazus ebeninus*), Sydney Rock Oyster (*Saccostrea glomerata*), with lesser amounts of Sydney Cockle (*Anadara trapezia*). No other shell species and no other animal or fish bone was noted. The shells were present in the light grey to brown grey sandy matrix that contained small amount of rounded pumice indicating reworking/redeposition by storm action, therefore the presence of nearby coast or ocean shore in the past. A total of 7 artefacts were recorded within the exposure consisting of quartz, coarse grained silcrete, chert, quartzite and fine grained siliceous flakes and a core. It was recommended that archaeological test excavations be undertaken in order to establish the full extent of the site.

In 2015 Neville Baker recorded an Aboriginal shell and artefact scatter site, Riverside Drive 1 (AHIMS 52-5-0819), located approximately 100 metres east of the study area (Figure 5). Five stone artefacts consisting of silcrete and quartz flakes and one quartzite hammerstone were identified within a disturbed infrastructure area within the active Minnamurra River tidal flat. Estuarine shell fragments were also identified in association with the artefacts. It was considered that prior to modern development the area would have been subject to active cycles of erosion and deposition which do not favour the preservation of Aboriginal sites. The soil is unconsolidated alluvial sand indicative of a very recent deposition. This suggested a very disturbed nature or imported cultural material.

Overall, previously recorded Aboriginal archaeological sites around the study area demonstrate a variety of site types and geographical locations. AHIMS results and background research indicate that a relationship exists between site type and environmental context, demonstrating the different ways in which Aboriginal people used the landscape and the subsequent archaeological record of these activities.

General assumptions that stem from the results of previous assessments in the estuarine environments point out that various sedimentation processes associated with the infilling of the estuary and the aggrading nature of lower slopes may have resulted in covering of the archaeological sites. Test excavations would most likely be necessary in order to determine whether the subsurface archaeological deposit is present. The most likely Aboriginal site types to occur within the study area and its surroundings are artefact scatters often associated with shell middens. They are likely to occur on the well-drained, remnant landforms bordering the estuary resource zones. They often might be exposed by land use practices, such as mining activities and removal of trees, or geomorphological processes, such as erosion and fluvial activity.

Within lowland areas along watercourses, artefact scatter sites and isolated finds are the most common site type, reflecting the day-to-day economic activities and camping locations of Aboriginal people. Along waterways closer to the coast, the association of shell remains with artefact deposits also indicates the exploitation of freshwater molluscs and possibly, earlier estuarine food resources, such as at sites 52-5-0251 – 52-5-0255. Higher levels of disturbance have also been reported at the lowland sites, in part due to the more concentrated modern land use of these areas for intensive agriculture, mining/quarrying, transport and urban development. Artefact raw materials identified at the sites are available from the diverse underlying regional geologies.

Artefact scatter sites have also been identified along ridgelines and in elevated areas, including at Locking Hill in the vicinity of the study area (52-2-1791) and on the high mid-slopes of Stockyard Mountain to the west (52-5-0310/52-5-0311). Previous archaeological investigations have suggested these elevated areas were used as travel corridors between the different resource zones of the coast and hinterland. Steep slopes and drainage gullies along the ridges are also less likely to have been subject to European land clearance, increasing the likelihood of remnant old growth vegetation and the survival of scarred trees.

Within the wider region, Aboriginal burials are known to occur in sand deposits similar to those present around Dunmore and elsewhere on the Illawarra Coastal Plain and South Coast. Ethnographic and historical sources, as well as consultation with the contemporary Aboriginal community, have identified the Minnamurra River and estuary as one location where such burials have taken place, however the historical record is vague and no specific location information is known. Based on the current assessment, the project area is considered no more or less likely than other similar environment to contain burials. The archaeological assessment and test excavation for the project did not identify any indications that Aboriginal burials exist within the project area, however it is acknowledged that

Aboriginal burials may exist anywhere given the correct conditions. A management procedure for the discovery of human remains is included in section 11 of this report.

Summary

The review of background information revealed there were no known Aboriginal archaeological sites within the study area. There are four AHIMS registered sites within 200 metres of the study area. Three AHIMS sites (52-5-0526, 52-5-0253 and 52-5-0819) identified within tidal flats and saline swampy environments were subject to active, recent cycles of erosion and deposition processes. As such, any cultural material identified is unlikely to have been in its primary context and it is highly unlikely that deep stratified deposits occur in these conditions. One AHIMS site located approximately 100 metres south of the study area within the same beach ridge landform as Stage 5B, revealed stratified cultural deposits of shell and artefacts (52-5-0117). Another Aboriginal archaeological site was recorded within the same environmental conditions approximately 500 meters south-west of the study area (52-5-0159).

The identification of these sites in close proximity to and within the same landforms as the study area indicates that the study area may display archaeological sensitivity to retain Aboriginal archaeological material. The northern portion of the Stage 5A has some moderate sensitivity to contain scattered cultural material that would not be in its primary context. The southern section has a high archaeological sensitivity to contain Aboriginal objects. Stage 5B has a high archaeological sensitivity to contain deep stratified cultural deposits relating to Aboriginal activities on this specific landform. Areas of archaeological potential will be dependent on the levels of previous disturbance including natural agents and recent land modifications.

5 Visual Inspection

Visual inspections were carried out as part of the Aboriginal heritage assessment of the study area. The visual inspection included a pedestrian walk and assessment of the entire study area. Visual inspection aimed to assess the integrity of the archaeologically sensitive landforms identified within the area, the nature and extent of previous disturbance, the potential for Aboriginal objects to be present within the area and heritage potential of the trees within the study area.

Assessment of the pipeline and access tracks west and north of Stage 5A between Princes Highway found the area substantially disturbed by previous construction and crossed mostly lower sensitivity tidal flat areas in association with Rocklow Creek and the Minnamurra River. Visibility was on average good with areas of exposure located around the pond and within access tracks. The entire low lying area has been significantly disturbed due to past land use, with no areas of archaeological potential identified.



Plate 3. Looking south from the pond between Princes Highway and Riverside Drive.



Plate 4. Conditions around the pond and access tracks.

The inspection continued along the spurline that connects the tidal flat with the ridgeline, east of ‘Dunmore House’ (Plate 5). South of the ridgeline an extensive alluvial flat (Plate 6) was encountered that contains a few landforms in association with the Minnamurra River estuary. A small drainage line and a pond is located at the bottom of the ridge, flowing east through to the estuary. The Stage 5B area is located within the beach ridge landform that encompasses the pond and the area to its immediate south. The entire area was covered in short grass, with occasional patches of mid to high grass and some scattered trees present within the southern section (Plate 7). Average ground surface visibility varied between excellent in areas stripped of grass and poor within areas of dense vegetation cover. Areas of exposure were visible throughout the inspected area (Plate 8). Some areas of surface disturbance were visible that most likely stem from patchy previous sand extraction, tree removals and cattle trampling. Exposures were visible around the pond and trees, and small eroded areas due to water run off.

Assessment of Stage 5B found the Holocene beach ridge sand/soils and Holocene back barrier flat sand/soil all exhibiting high archaeological potential.

The estuarine environment around the Minnamurra River that established after the stabilisation of sea levels provided a great variety of predictable seasonal resources throughout the year for Aboriginal people. Sand bodies on the estuarine fringes are archaeologically sensitive landforms as they are elevated landforms that represent depositional land systems created by repeated and successive dune accretion, and as such are prone to conserve deep archaeological deposits. They would also have offered attractive camping locations.



Plate 5. Access driveway along the spurline, facing south.



Plate 6. View of the beach ridge from the ridgeline, facing south-east.



Plate 7. Scattered trees present within the southern section of area 5B.



Plate 8. Soil conditions within study area 5B.

Along the base of the hill representing the northern edge of Stage 5B was a truncated creek and pond (Plate 9). The exposed sands around the pond and creek exhibited numerous Aboriginal objects and some natural shell. The shell consisted of gastropod adult Mud Whelk (*Pyrazus ebeninus*) (Plate 10) in low dispersed densities and a natural size range. The Aboriginal objects consisted of flakes made from silcrete, jasper, petrified wood and chert; pebble cores of silcrete and quartzite; blades of fine silcrete and jasper (Plates 11 and 12). The site was recorded as Aboriginal artefact scatter DLS Boral AFT 1 (AHIMS 52-5-0907). It was determined that further Aboriginal cultural material and subsurface stratified archaeological deposits were likely present within the entire beach ridge landform in the Stage 5B area.



Plate 9. Conditions and exposures within the pond, facing south.



Plate 10. Non artefactual Mud Whelk species located within the exposed banks of the pond.



Plate 11. Pebble cores and flakes made of silcrete, jasper and petrified wood, located within the pond exposures



Plate 12. Petrified wood, jasper, silcrete and chert flakes and blades, located within the pond exposures in Stage 5B.

Further inspection was carried out within the southern section of the Stage 5B area within the entire beach ridge landform. The southern extent of this portion of the study area is covered with scattered trees. The surface was mainly covered in short to high grass, with scattered trees that included mainly regrowth, with occasional mature trees (Plate 13). The south-western section revealed denser grass cover than the northern part, with only occasional areas of exposure (Plate 14). Sandy conditions were noted with some shallow surface disturbance due to cattle trampling, tree removal activities, installation of fences and pedestrian and light vehicle traffic. Trees were carefully inspected for possible cultural modifications. No Aboriginal scarred trees were identified.

Considering the identification of artefacts within eroded banks of the pond, beach ridge sandy soils and low levels of previous disturbance, the section of the Stage 5B study area to the south was considered to have high archaeological potential for further Aboriginal cultural material to be present (Plate 16). Aboriginal stakeholders also noted that these landforms were sensitive for Aboriginal burials to occur.



Plate 13. Southern section of Stage 5B area, within beach ridge, facing north-east.



Plate 14. South-western section of Stage 5B area, general conditions, facing north.

A small depression located along the eastern boundary of the Stage 5B area indicates the location of the tidal flat associated with the Minnamurra River estuary. Vegetation cover in this section was evidently thicker and greener which stems from swampy, wet conditions. A small pond in this landform contained water and its banks were covered in vegetation. No mature native trees were observed that could have contained cultural scars. Ground surface visibility was moderate with occasional areas of exposure due to water runoff and cattle trampling. No evident disturbance was noted, with the surface revealing sandy conditions.

The tidal flat landform is low-lying and would not have been a preferred long-term occupation area in the past. In addition, tidal flats are subject to geomorphologically active cycles of erosion and deposition which do not favour the preservation of Aboriginal sites. Results of the AHIMS review revealed that Aboriginal sites can however occur in these environmental settings. Any archaeological material located would be in a disturbed context with no stratified occupational deposits, and would represent dispersed cultural material. No Aboriginal cultural material was observed during the site inspection and no areas of potential subsurface archaeological deposits were identified.



Plate 15. Tidal flat landform and small pond located to the east of the beach ridge in Stage 5B area, facing north-west.



Plate 16. Looking south-west from the tidal flat across the elevated beach ridge within Stage 5B area.

Site inspection then continued within the proposed Stage 5A area, located to the immediate west of Riverside Drive. The northern section of the study area lies within a tidal flat located between Riverside Drive and the slopes associated with the ridgeline. It grades into the backbarrier flat (sand body) to the south, which was clearly marked by distinct vegetation cover and a slightly raised ground level (Plate 18).

The tidal flat landform was covered in thick but short pasture grass (Plate 17). Ground surface visibility was very low with some exposure areas limited to the informal vehicle track located along the bottom of the slopes. Very swampy, wet conditions were also observed in this section of the study area, with a sandy loam soil matrix. The tidal flat landform is an active land system prone to repeated erosion and deposition events, and as such is unlikely to preserve archaeological material *in situ*. Any cultural material located within this landform would not be in its primary context. No Aboriginal cultural material was located during the site inspection within the northern section of 5A, in the tidal flat landform. Archaeological potential for deep stratified occupational deposits to be present in this landform was considered to be low.



Plate 17. Tidal flat, Stage 5A study area, looking from slopes, facing north-east.



Plate 18. Tidal flat and backbarrier flat within Stage 5B study area, facing south-east.

The western extension of the Stage 5A study area (designated as an overburden stockpile area) is located within the steep lower slopes of the ridgeline that extends between Stages 5A and 5B. Slopes revealed very shallow soils consisting of silty loams and exposed latite bedrock (Plates 19-20). Significant levels of disturbance were also evident in this section of the area, due to the installation of a well for grazing purposes. Exposures were visible in these disturbed areas and also due to water runoff and stock trampling. Steep slopes would not be conducive for human occupation and shallow soils would not preserve any subsurface archaeological deposits. The slope landform was considered to have very low archaeological potential for Aboriginal cultural material to be present.



Plate 19. Steep slopes of the ridgeline and exposed latite bedrock, facing south.



Plate 20. Shallow soil conditions on steep slope landform, western part of Stage 5B area.

An extensive sand body was encountered during the site inspection within the southern section of the Stage 5A area, to the immediate south of the tidal flat. This area corresponds to a coastal barrier backbarrier flat. It was a slightly elevated landform with fine sandy conditions (Plate 21). The sand body extended from Riverside Drive to the east to the slopes of the ridgeline to the west and south. Ground surface visibility was moderate with some exposures observed due to disturbed areas and cattle trampling. Disturbance was visible mainly within the south-eastern portion, likely due to tree removal. A decayed wood dump was also noted in this area (Plate 22).

The back barrier flat landform represents a remnant landform formed by storm washover deposition during the initial stages of barrier evolution. It is generally a relict feature that is unaffected by contemporary geomorphological processes. As such it may retain deep stratified deposits. Any cultural material located within these deposits would be well preserved and most likely in primary context. The elevated nature of the sand body would make it a preferable location for repeated occupation events by Aboriginal people in the past, considering proximity to resources. Recent land use practices would impact on sandy surface soils, but the majority of the sandy deposit would be intact. No surface Aboriginal cultural material was identified during the site inspection. This southern section of Stage 5A was considered to have high archaeological potential to contain deep stratified occupation deposits.



Plate 21. Sand body - back barrier flat located within the southern section of the Stage 5A study area, facing north; general conditions.



Plate 22. Disturbances within the back barrier flat, facing west.

Surface exposure across the study area was generally low and visibility within surface exposures was low to moderate. Surface exposure was dependant on vegetation density, natural processes such as erosion and modern land use practices, with exposures most commonly the result of water runoff, cattle trampling and along tracks. The various landforms in the study area were treated as individual assessment units due to their similarities in physical environment and landscape use. The area of severe disturbance along the road and areas of extensive land modification/recontouring was assessed as a separate 'Disturbed' unit.

Some variation in effective coverage was evident between landforms (see Tables 2a and 2b below). Effective coverage was highest for the drainage depression, which had numerous exposures of underlying sandy soils, followed by the slope and 'disturbed' units, due to increased erosion and landscape disturbance along the roadsides. The ridgeline, back barrier flat and beach ridge had similar levels of exposure and visibility, hampered by pasture grasses. The tidal flat had the least exposure with thick grasses and vegetation. Despite limited exposure and visibility, the assessment was able to identify an archaeological site and make assessments of archaeological potential across the inspection area.

Table 2a. Assessment coverage

Unit	Landform	Area (m ²)	Exposure (%)	Visibility (%)	Effective Coverage (m ²)	Effective Coverage (%)
1	Back barrier flat	15,081	15	50	1131.075	7.5
2	Beach ridge	76,496	15	50	5737.2	7.5
3	Disturbed	29,779	20	70	4169.06	14
4	Drainage depression	8,924	50	70	3123.4	35
5	Ridgeline	1,433	20	50	143.3	10
6	Slope	10,904	25	60	1635.6	15
7	Tidal flat	24,620	5	20	246.2	1

Table 2b. Landform coverage

Landform	Area (m ²)	Area Effectively Surveyed (m ²)	% of Landform Effectively Surveyed	# of Sites
Back barrier flat	15,081	1131.075	7.5	-
Beach ridge	76,496	5737.2	7.5	1
Disturbed	29,779	4169.06	14	-
Drainage depression	8,924	3123.4	35	-
Ridgeline	1,433	143.3	10	-
Slope	10,904	1635.6	15	-
Tidal flat	24,620	246.2	1	-

Summary

Previous archaeological assessments and the distribution of recorded archaeological sites across the landscape indicate a strong relationship between site type and geological, topographic and geographic factors. Additionally, environmental factors contribute directly to survivability of archaeological sites within the landscape. Within the study area, elevated sand bodies above the former estuarine environments are the most archaeologically sensitive landform. Aboriginal archaeological sites associated with these landscape features would have the potential to contribute significantly to our understanding of Aboriginal landscape use of these unique environmental contexts.

Visual inspection confirmed the potential for Aboriginal objects based on: stability of deposit, intact soil profiles, topographically favourable features related to elevated level ground and vistas, proximity to known archaeological sites and presence of surface Aboriginal objects within the eroded areas. Ground surface visibility within the study area varied from high to low with some exposures limited within tracks, around trees and within the banks of a pond in the Stage 5B area. Identified artefacts were recorded as DLS Boral AFT 1, an artefact scatter site (Figure 6) located within the beach ridge landform. Archaeological potential for subsurface archaeological deposits was assessed as high.

The Stage 5A area revealed dense grass cover and a lack of exposure areas. No Aboriginal objects were identified during the field inspection. Considering the environmental setting, low degree of previous disturbance, intact sandy soil conditions and previously recorded sites within similar conditions, it was considered that the southern portion of the Stage 5A area within the back barrier flat contains high archaeological potential for subsurface Aboriginal objects to be present. The tidal flat located in the northern section of the Stage 5A area was considered to have moderate potential to contain cultural material that would be in a secondary (disturbed geomorphic) context.

Further detailed investigation (subsurface testing) was therefore recommended to determine the nature, extent and significance of any archaeological sites and potential archaeological deposits within the study area.

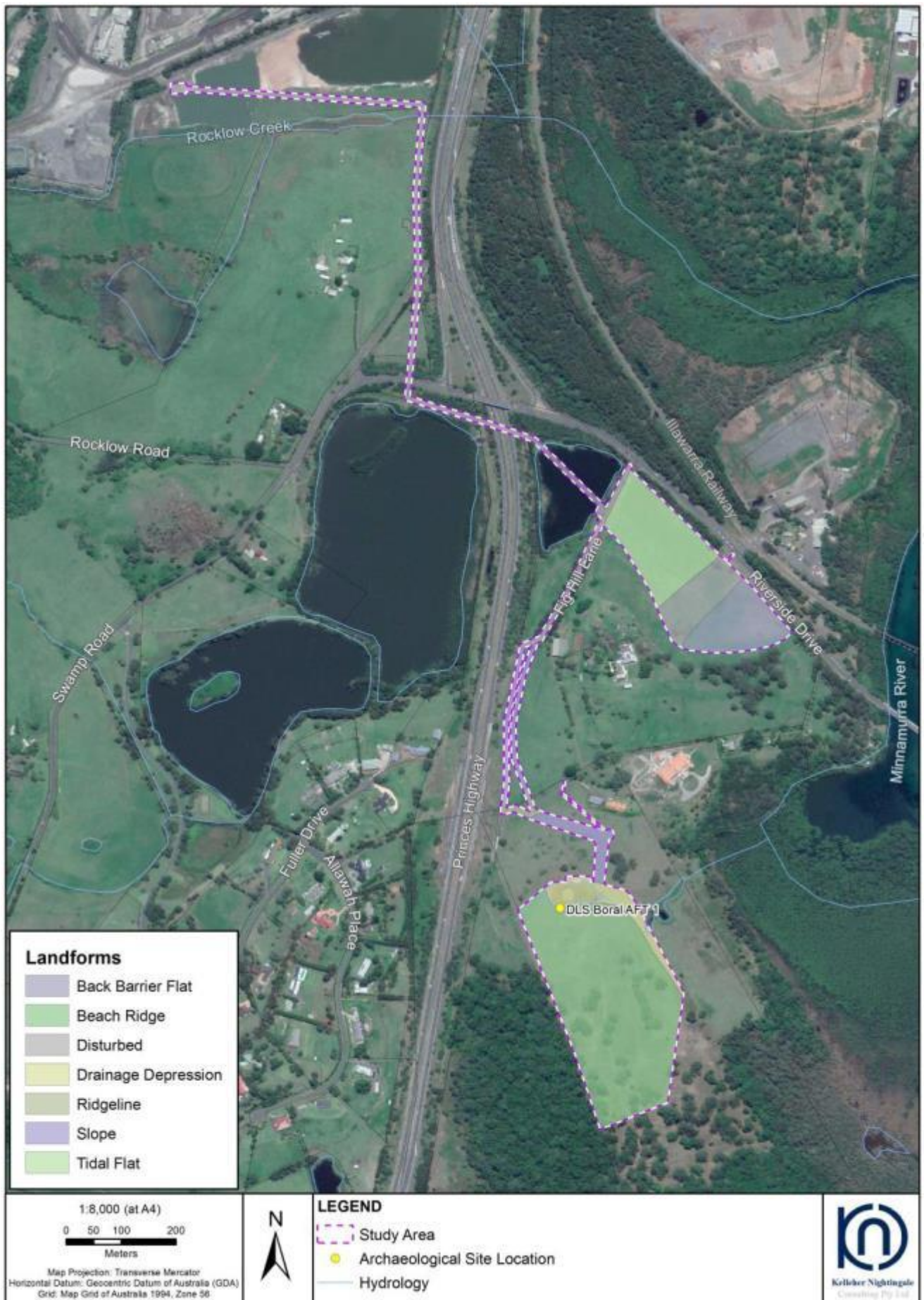


Figure 6. Visual inspection results, landforms/assessment units and recorded Aboriginal site, DLS Boral AFT 1.

6 Archaeological Test Excavation

Archaeological test excavation was carried out by KNC and registered Aboriginal stakeholders over five days between in November 2018, in accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Aims, methodology and results of the test excavation program are presented below.

6.1 Aims

The purpose of the test excavation program was to collect information about the nature, extent and significance of the Aboriginal site DLS Boral AFT 1 recorded during the site inspection within the Stage 5B area; and to determine whether subsurface Aboriginal objects occurred in the Stage 5A area. Test areas at Stage 5B and the southern portion of Stage 5A were considered to have high archaeological potential for subsurface Aboriginal objects to be present. Therefore the primary aim of the test program was to confirm the presence, nature and extent of potential archaeological deposits within the 5A and 5B areas. Additional goals of the test excavation were: to assess the boundary of the site areas in relation to the proposed development, to investigate the relationship between specific topographic features and archaeological deposits and to observe the effects of disturbance on archaeological deposits.

Test excavation results would inform the archaeological assessment, including development of appropriate management and mitigation measures. The testing area was restricted to ensure an adequate sample without having significant impact on the archaeological value of any identified sites.

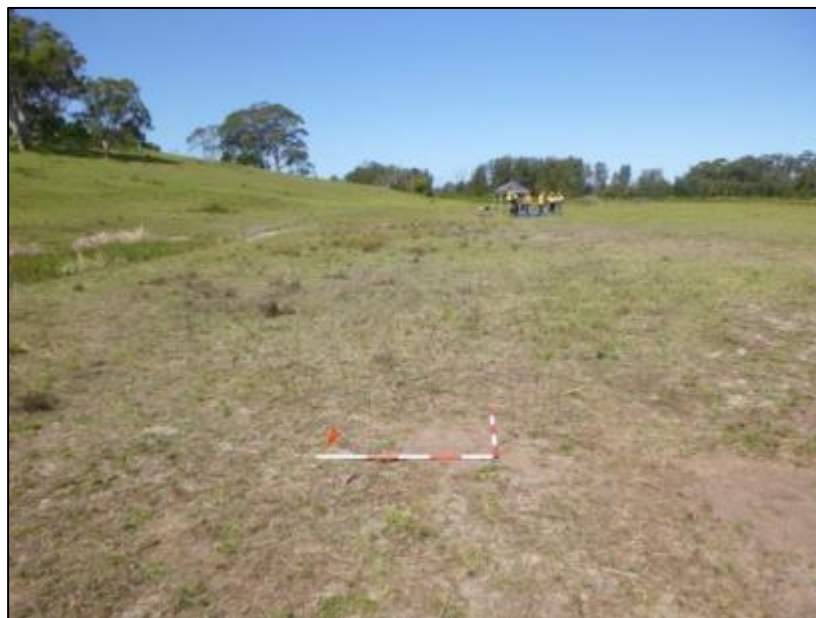


Plate 23. View to south-east along baseline transect from TS4, Stage 5B study area; natural pond at left.

6.2 Methodology

The field methodology was developed and carried out in accordance with Requirement 16a of the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. The study area was divided into two excavation areas based on the proposed extraction stages. The back barrier in the Stage 5A area and the beach ridge in 5B were considered to have high archaeological potential; the tidal flat in 5A was considered to have moderate archaeological potential. The main aim of testing the tidal flat was to determine soil conditions in order to assess if they would be prone to conserving subsurface archaeological deposits. The proposed test areas were differentiated from the surrounding landscape by the presence of unique Quaternary depositional systems (coastal barrier units) and spatially defined by the presence of flanking estuarine and alluvial landforms. Test transects were placed across the areas to confirm the presence/absence, location and extent of archaeological deposits.

Test transects were placed on a systematic grid at 20m intervals and test excavation units placed at 10-40m intervals along these transects, based on the encountered surface disturbance and/or the extent of the study area. Interval distances were evaluated as the program progressed, with 20m being confirmed based on retrieved artefact assemblages indicating the sampling program identified robust site variation (ranging from very high density to lower density units). Easting/northing coordinates were taken at the north west corner of each excavation unit. The test units at each area were then given an arbitrary identifying number (e.g. TS 1, TS 2, TS 3). Test excavation units measured 50cm x 50cm.

At five locations, additional test excavation units were placed next to the already excavated units in order to test the depth of encountered archaeological deposit or its nature. These additional adjoining units were given an additional reference letter (e.g.1B, 1C). A total of 45 test squares (11.25m²) were excavated: 17 at Stage 5A and 28 at Stage 5B.

In accordance with the *Code of Practice*, the first excavation unit of each investigation area (each landform) was excavated in 5cm spits onto a culturally sterile deposit to determine the nature of the subsurface deposit and the presence or absence of artefactual material. The majority of test excavation squares were limited to 1m depth. Two excavation units were excavated to 1.2m in order to determine if the same soil matrix with archaeological deposit was present. Based on the results of the first excavation square, subsequent squares in each area were excavated in 10cm spits until culturally sterile deposit or 1m depth was reached.

Where artefacts were identified during excavation (i.e. *in situ*), measurements were taken of the artefact's position and depth in the excavation unit, as well as its relation to any other features such as charcoal, baked clay, tree roots or other evidence of disturbance. When possible cultural features were encountered, these were excavated and sieved as a separate unit.

All excavation was undertaken using hand tools. All excavated material was placed in buckets and transported to the adjacent sieving area and dry sieved using a combination of nested 5 millimetre and 2.5 millimetre wire mesh screens. Artefacts retrieved from the excavation were retained for further investigation.

The information from each test excavation square including a detailed deposit description, any excavated features and unit depths were recorded onto standardised excavation forms. At the end of the excavation program, all squares were photographed and soil section profiles were drawn. As per OEH requirements, the test excavation ceased when enough information had been recovered to adequately characterise the archaeological deposits or Aboriginal objects present with regard to their nature and significance.

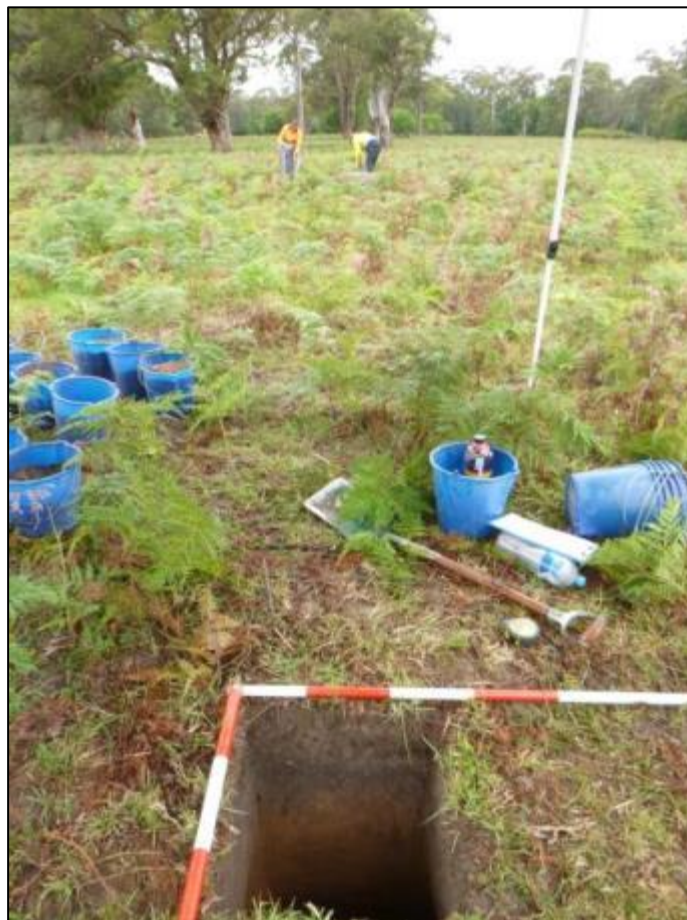


Plate 24. Hand excavated 50cm x 50cm test square, TS20, Stage 5B study area, facing south.

Excavation Director: Dr Matthew Kelleher

Archaeologist/Site Supervisor: Ana Jakovljevic

KNC Archaeologists: Owen Barrett, Carly Todhunter, Waleed Al Mendin

Aboriginal Stakeholder Representatives: Steven Henry (ILALC), James Davis, Kayla Williamson (WPGEC), Mark Dutton (Goobah) and Leanne Tungai.

6.3 Results

6.3.1 Stage 5A area

Test excavation at Stage 5A aimed to determine if subsurface archaeological deposits existed within two landforms: the back barrier flat landform located within the southern section of Stage 5A that was assessed as having high archaeological potential; and the tidal flat landform located within the northern section of Stage 5A that was assessed as having less archaeological potential. The entire study area has gone through varied levels of previous disturbance including vegetation clearance and stump removal. Localised areas of tree dumping were present within the southernmost part of the study area, but overall the integrity of this part of the study area was good. Observation of the soils suggested a stable profile.

A total of 17 test squares were excavated across 5 transects. Transects were placed in a north-west – south-east, and north-east – south-west direction, with test squares on a 20m interval grid (Figure 7).

The northern section of the study area was located within the low lying tidal flat, with dense vegetation cover and very wet surface conditions. A total of 2 test squares were excavated along a north-east – south-west oriented transect, spaced 20 metres apart (TS 15 and TS 16).

Within the central part of the study area, a slightly elevated landform with loamy surface conditions was subject to test excavation. Three test squares were excavated along a north-west – south-east transect, 20 metres apart (TS 1, TS 2 and TS 3).

The back barrier flat landform comprised an elevated sand body within the southern section of the study area. The area had sparse vegetation cover with one section at the southernmost part observed to have gone through previous disturbance. A total of 12 test squares were excavated along three transects: two transects along a north-west – south-east orientation (TS 4 – 11, including TS 6A and 6B), and one transect along a north-east – south-west orientation (TS 12 – 14), in 20m intervals.



Plate 25. Tidal flat, facing west, showing TS 15 across the landform towards the slopes.



Plate 26. Facing south-east, showing TS 5 across the back barrier sand body and TS 6A and 6B in the distance.

6.3.1.1 Soils, stratigraphy and disturbance

Sediment profiles varied across the two different landforms. One area of significant disturbance was identified stretching throughout the central section of the study area. Representative sections of test squares across the study area are presented and described below according to three different soil profiles.

The elevated landform area identified within the central section of the study area revealed a significant amount of fill material throughout (TS 1-3) Units were excavated to a maximum depth of 35 centimetres. No natural soils were encountered. It was considered that the entire elevated area had a significant amount of fill material deposited (Plate 27). Soil mapping identified the fill layer as covering an estuarine plain system of tidal flats. Assessment of the tidal flat indicated a low likelihood for Aboriginal objects due to less suitable – swampy – conditions not suitable for occupation (soils are prone to be damp). While deep sands are associated with these geologic systems it is improbable that intact archaeology will survive below the upper unit as any surface deposits are quickly dissipated into the humic layer and then migrate (as diluvium or illuvium) through the soil profiles.

The southern section of the study area within the back barrier sand body revealed a deep sandy soil matrix to the base of test squares. Some fill material was encountered from 5 to 25 centimetres depth in TS 4, 11, 12, 13 and 14. A

pipeline was also encountered in TS 10 at 60 cm depth and the pit was abandoned. Fine root systems were present throughout the area, with charcoal flecks and burnt tree roots encountered in the majority of excavated units, limited to the first 60 cm depth. Soil profiles were relatively uniform throughout the landform.

Deep sandy deposits consisted of between 30 and 60 centimetres of grey sand with frequent charcoal flecks and fragments, overlying up to 40 centimetres of light greyish brown and light brown sand, and slightly darker, orange brown sand from on average 80 centimetres depth to base levels of up to 1.2 metres depth (Plate 28).

The tidal flat located within the northern low lying section of the study area revealed very wet, swampy conditions. No areas of significant ground disturbance were identified. Fine root systems were present within the first 10 centimetres. Soils consisted of up to 10 centimetres of dark grey, almost black sand with gravel and ironstone inclusions, overlying between 10 and 20 centimetres of moist brown grey sand, and up to 30 centimetres of light brown sand. The base of excavation encountered the water table at an average of 70 centimetres depth (Plate 29). The tidal flat represented an area of relatively rapid (humic) soil cycling and damp-wet soils generally less suitable for intensive occupation by past Aboriginal people.



Plate 27. Stage 5A - TS3 south section

- I. 0-25cm: Dark grey-brown loam, humic. Abundant rock inclusions to <15cm 20% including road base, bricks, sandstone and ironstone. Scattered lumps of clay. Diffuse boundary to:
- II. 25cm-35cm: Dark orange brown clayey loam. Mixed lumps of clay, ironstone pieces and scattered rocks and gravel.
- III. At 35cm: Orange and grey clay clumps, mixed with rocks and gravels.



Plate 28. Stage 5A, back barrier landform, TS6B east section

- I. 0-8cm: Medium grey sand, humic layer. Frequent fine root systems throughout. Diffuse boundary to:
- II. 8-36cm: Medium grey sand. Charcoal fragments between 30 and 36cm. Diffuse boundary to:
- III. 36-63cm: Light greyish brown fine sand. Larger charcoal fragments between 45 and 60 cm mainly within the southern section. Diffuse boundary to:
- IV. 63-78cm: Light orangy brown sand. Some mottled light brown sand mottled. Diffuse boundary to:
- V. 78cm-base: Orangy brown sand, moist. Continuing to the base
- VI. Base: Orangy brown sand.



Plate 29. Stage 5A, tidal flat landform, TS15, north section

- I. 0-9cm: Dark grey sand, humic layer. Frequent fine root systems throughout. Diffuse boundary to:
- II. 9-30cm: Dark grey, almost black sand, moist. Ironstone and gravel inclusions, approximately 10%. Possible acid sulphate contamination due to the strong odour. Clear boundary to:
- III. 30-48cm: Brown grey sand, moist. Diffuse boundary to:
- IV. 48cm-base: Light brown sand, high moisture content. Clear boundary to:
- V. Base: Light brown sand. Water table encountered.

6.3.1.2 Artefact Distribution

Three artefacts were recovered from the three units excavated within the disturbed area (TS 1-3). They consisted of two quartz angular fragments, and one quartz retouched flake. Since they were identified within disturbed fill material, they are not located within their primary context. It is possible that they were imported to the area or they represent dispersed cultural material from the vicinity. These three artefacts were recorded as an Aboriginal site representing isolated, disturbed cultural material: DLS Boral AFT 3 (AHIMS 52-5-0909).

A more significant deposit was identified across the back barrier landform test area (TS 4 – 14). A total of 461 artefacts were recovered from the 12 test excavation units within this back barrier landform. The site was recorded as artefact scatter DLS Boral AFT 2 (AHIMS 52-5-0908). Artefact densities for these test squares are shown in Table 3 and Figure 7.

Table 3. Test excavation artefact densities at site DLS Boral AFT 2

Test square	Total artefacts
4	9
5	47
6A	24
6B	39
7	89
8	66
9	29
10	2
11	61
12	36
13	47
14	12

Artefact distribution within DLS Boral AFT 2 was characterised by low to high density deposits. Test square 10 contained the lowest number of artefacts. This is due to the fact that the test unit was abandoned at 50 cm depth due to identified disturbance, so results from this test square are not relevant for the discussion of overall results. Apart from TS 10, test squares 9 and 14 contained the lowest number of artefacts. These excavation units were located within the margins of the back barrier sand body, i.e. at the margins of the site extent. The area of the highest artefact density was located within the middle section of the sand body, with no areas of identified disturbance. Test square 7 had the highest (extrapolated) mean artefact density with 356/m², followed by test square 8 (264/m²) and TS 11 (244/m²).

Extrapolated to square metres, the site area displayed a mean artefact density of 115.3/m².

Table 4. Spit depths and artefact count.

<i>Test square</i>	<i>4</i>	<i>5</i>	<i>6A</i>	<i>6B</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>Total</i>
0-10	4	1	1			1				1	10		18
10-20		2				1				1	3		7
20-30		3	1			2					1	2	9
30-40		1		2	2		5		1			9	20
40-50			2	1	5	2	5		3		1		19
50-60		5	7	8	9	2	13	2	17	11	6		80
60-70	1	17	12	23	66	16	3		34	23	25		220
70-80	2	16	1	5		32	3		3		1	1	64
80-90	1	2			6	10			2				21
90-100	1				1				1				3
	9	47	24	39	89	66	29	2	61	36	47	12	461

A total of 14 artefacts were recovered from the top 17 centimetres in both TS4 and TS13, which contained fill material. Although it is not possible to determine their primary context, these artefacts were included in the assemblage as they were found within the perimeter of the site. Raw material and artefact types indicate that it is possible they represent dispersed/disturbed cultural material from the area that was mixed with the introduced fill.

The majority of artefacts followed a classic bell curve (adjusted for surface disturbance) and were found from 60 to 70 cm depth (n=220, 48%), followed on either side of the curve between 50 and 60cm (n=81, 17%) and between 70 and 80cm (n=64, 13%) (Table 4). All of these artefacts were recovered from light orange-brown sand deposits. These results indicate that the majority of the cultural material is preserved within the subsoil sandy horizon that represents a relatively stable and intact soil (barrier sands). Although artefact numbers decrease from 80 centimetres depth, they were still recovered from as deep as 90 centimetres, although these artefacts (0.2% of the total) represent statistical taphonomic movement rather than depositional action. (Square 6A was excavated to 120cm to confirm culturally sterile deposit below 1metre.) The water table was encountered in most squares by 90cm and sands below this level are culturally sterile representing the estuarine tidal flat sands transition with a low likelihood of intact archaeological deposit. The association with the deep quaternary sands between the back barrier flat (test squares 4-14) and the tidal (mud) flats (test squares 1-3, 15-16) displays of fluvial connection – the lower (orange/brown sands) demonstrating a proto-estuarine sand body separated by the backbarrier flat with a saline swamp frontage. In effect all of the deeper sands underlying this entire system are part of the same estuarine body exhibiting low archaeological potential. In the field this was observed when encountering the organic (orange/brown sand) and water table. When the barrier sands became established they cut off the tidal flats with a physical barrier of sand. Archaeologically only this barrier sand itself will be archaeologically sensitive as the flux in the underlying sands (identified by organic content and water table) prevent the deposition, accumulation and survivability of archaeological objects.

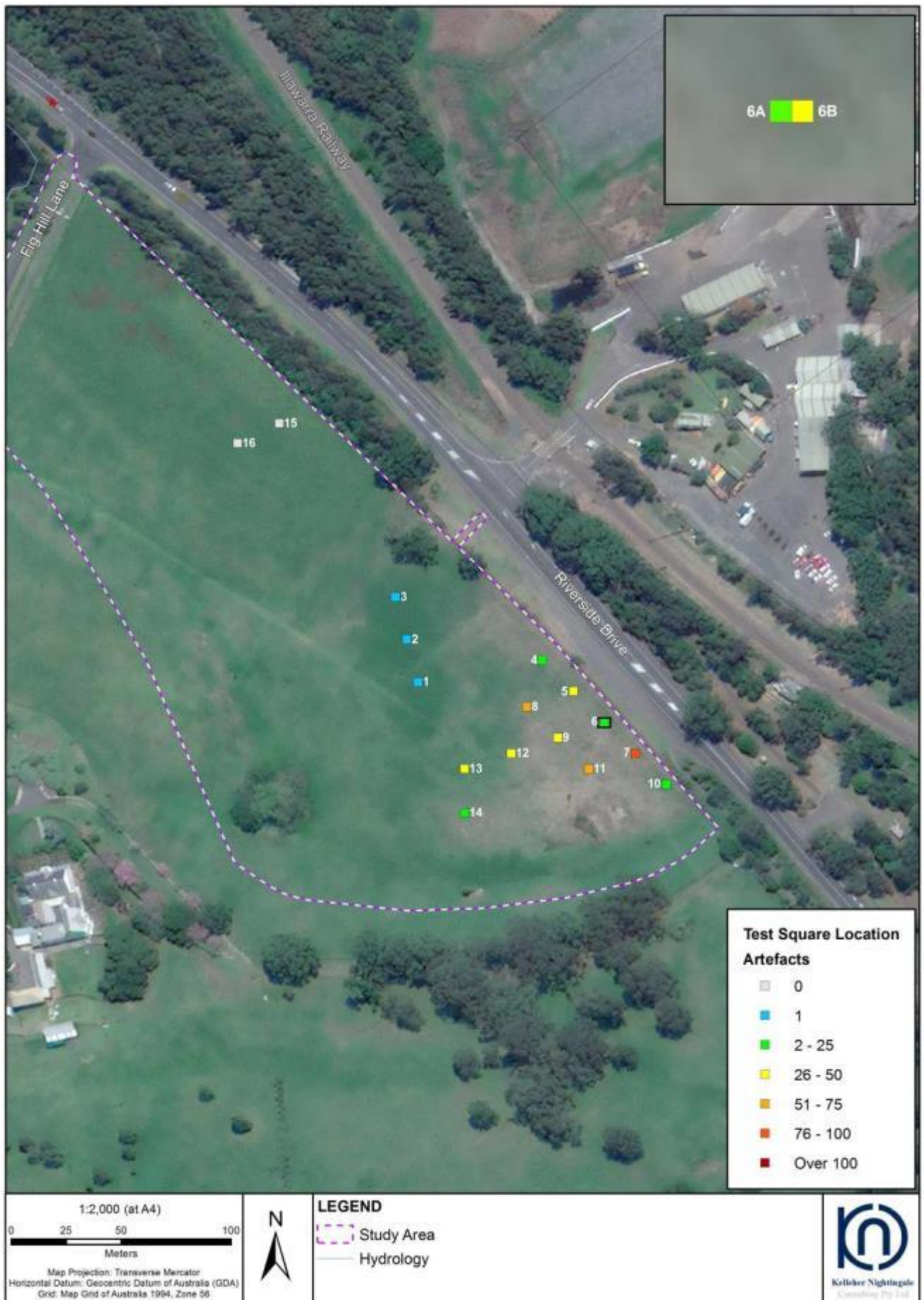


Figure 7. Stage 5A study area test square locations and artefact density.

6.3.1.3 Lithics

The dominant raw material was quartz (n=225, 48.8%), followed by silcrete (n=84, 18%), fine grained siliceous (FGS) (n=59, 12.7%) and chert (n=47, 10%). A range of other raw material was recorded including chalcedony, medium grained siliceous, petrified wood, tuff, and one each of mudstone, sandstone and quartzite (Table 5). Artefacts were generally small, with the majority between 5 and 14 millimetres (Table 5). The least number of artefacts were between 35 and 59 millimetres. The largest artefact was between 100 and 104 millimetres, comprising a hammerstone made from MGS recovered *in situ* from 65-69 centimetres depth in TS 13 (Plate 30). Artefacts measuring between 24 and 29 millimetres had the greatest variety of raw material present.

The majority of artefacts were flakes (n=200, 43.3%) and non-diagnostic flaked angular fragments (n=159, 34%) (Table 6). Other artefact types had much lesser representation, including proximal, distal and split flake fragments (average 5% each). Cores were not abundant in the assemblage (n=11, 2.3%), but were represented across a variety of raw materials, with the majority made of quartz and silcrete, and one each of chalcedony, chert, FGS and jasper. A jasper core was identified in TS 9 from depths between 50 and 60 centimetres; it was previously a flake, but recycled to be used as a core with one clear negative scar. The same test square contained four more jasper artefacts with one retouched angular fragment at 30-40cm depth (Plate 30) and one angular fragment at 70 centimetres depth. The recycling indicates that this material was likely highly valued in the area. Two bipolar quartz cores were recovered from TS 12, one from 10 centimetres and one from 50-60 centimetres.

No formal tools were recorded within DLS Boral AFT 2, but a total of 20 retouched/backed artefacts were identified, both with and without usewear. The majority of backed artefacts were made of white and grey white crystalline quartz, with one exhibiting characteristics of a chisel point, recovered from TS 11, spit 7 (Plate 32). Three retouched crystalline quartz backed artefacts were recovered from TS 7, and two from TS 6B located 20 metres to the north-west. This indicates that a particular activity was most likely occurring in this area. TS 9 contained three retouched artefacts made of jasper, chalcedony and silcrete (Plates 31 and 33). These were located at depths of 30-60 centimetres, from a light grey sandy layer. It is unclear if this preference of raw material for backed artefacts indicates events from two different occupation deposits, stemming from different episodes of site use. Further investigations would be required in order to answer this question.



Plate 30. Hammerstone made from MGS recovered *in situ* from TS 13 from 65-69 centimetres depth (ID 430).



Plate 31. Jasper core and flakes (ID 297-299), TS 9, 50-60cm depth, jasper retouched angular fragment (ID 281), 30-40cm depth.



Plate 32. Crystalline quartz backed artefacts (ID 118 - TS 6B, ID 150, 151 and 155 TS 7, spit 7.



Plate 33. Variety of raw material in TS 9 (ID 297, 298, 293) including silcrete retouched flake (ID 292) and jasper (ID 306).

Although low in artefact count, TS 9 revealed the greatest variety of raw material types. A general trend was observed that chalcedony, jasper, chert and FGS were more frequent in upper layers, with quartz prevailing within deeper light yellow sandy soils, followed by a small representation of silcrete and chert (Plate 33).

It was noted that the majority of artefacts do not show traces of reworking or other damage from movement or disturbance, indicating the stable soil matrix forms their primary archaeological context.

Table 5. Artefact raw material distribution and size at DLS Boral AFT 2

Raw Material	0-4mm	5-9mm	10-14mm	15-19mm	20-24mm	25-29mm	30-34mm	35-39mm	45-49mm	50-54mm	55-59mm	100-104mm	Total
Quartz	29	97	63	15	11	4	1		1		1		222
Quartzite				1									1
Chalcedony		6	7	2									15
Chert	3	14	17	7	3	3							47
FGS	5	25	18	8	1	2							59
MGS		1	2			1		1		1		1	7
P. Wood		5		1		1							7
Igneous			1										1
Jasper		5	4	3	1	1							14
Mudstone						1							1
Sandstone						1							1
Silcrete	1	34	27	6	9	3	3	1					84
Tuff						2							2
Total	38	187	139	43	25	19	4	2	1	1	1	1	461

Table 6. Reduction types at DLS Boral AFT 2

Raw Material	Flake	Proximal Fragment	Distal Fragment	Split Fragment	Medial Fragment	Angular Fragment	Core	Hammerstone
Quartz	106	5	9	12	2	84	4	
Quartzite	1							
Chalcedony	11		1			2	1	
Chert	25	3	6	4		8	1	
FGS	14	6	5	5	1	27	1	
MGS	2					4		1
P. Wood	4	1				2		
Igneous	1							
Jasper	5		3			5	1	
Mudstone	1							
Sandstone						1		
Silcrete	28	10	8	7	7	21	3	
Tuff	1					1		
Total	199	25	32	28	10	155	11	1

Cortex was relatively infrequent on artefacts recovered from DLS Boral AFT 2. Cortex was recorded on 47 artefacts, representing 10.2% of the site assemblage (Table 7). Artefacts made of petrified wood, igneous, jasper, mudstone and sandstone did not display any cortex. Quartz was the raw material that displayed the highest frequency of cortex (n=31, 65.9% of all cortical artefacts). Surfaces of 1-30% cortex were recorded on 41 artefacts (87% of cortical artefacts), with only 2 quartz cores having >70% cortex. The results indicate that while some knapping did occur in the area, primary and secondary reduction of cores was not a focus of activity at the site.

Table 7. Amount of cortex on artefacts from DLS Boral AFT 2, in relation to raw material and artefact type.

	0%	1-30%	31-69%	>70%	Total
Quartz	191	27	2	2	222
Quartzite	1				1
Chalcedony	14		1		15
Chert	44	3			47
FGS	56	3			59
MGS	5		2		7
Petrified Wood	7				7
Igneous	1				1
Jasper	14				14
Mudstone	1				1
Sandstone	1				1
Silcrete	78	6			84
Tuff	1	1			2
Total	414	40	5	2	461

	0%	1-30%	31-69%	>70%	Total
Core	7	1	1	2	11
Flake	181	14	4		199
Proximal Fragment	24	1			25
Distal Fragment	29	3			32
Split Flake	26	2			28
Medial Fragment	10				10
Angular Fragment	136	19			155
Hammerstone	1				1
Total	414	40	5	2	461

6.3.2 Stage 5B area

Test excavations within the Stage 5B area aimed to determine if further subsurface archaeological deposits occurred in association with the recorded Aboriginal cultural material within the exposed banks of the pond, recorded as artefact scatter site DLS Boral AFT 1. The site was recorded during the site inspection, when it was considered that the entire beach ridge landform south of the pond had high archaeological potential for subsurface Aboriginal objects to occur. Stage 5B is located in its entirety within the beach ridge landform. Beach ridge landforms represent successive periods of beach and frontal dune accretion during prolonged geological time scales; therefore it most likely contains deep stratified intact sandy deposits. It is also located adjacent to the estuarine environments that would have contained a wide variety of resources extensively utilised by Aboriginal people in the past. Sandy, elevated and well-drained landforms are known to be suitable for long-term and /or repeated human occupation.

A total of 28 test units along a series of east-west, and north-west – south-east transects were excavated at 20-40 metre intervals across the study area (Figure 8). The entire study area has gone through varied levels of disturbance including vegetation clearance, stump removal and agricultural activity. Overall, the study area was flat with some undulating sections, possibly due to minor sand extraction activities within the southernmost parts. On average the integrity of the study area was good. Observation of the soils suggested a stable profile.

Fine root systems were present throughout the area, mainly within first 20 centimetres. Larger root channels were occasionally found within topsoil (e.g. TS 15) but also within the lower depths of 80-100cm (TS 2A and 2B). Small fragmented pieces of charcoal were dispersed throughout the deposit in the majority of test squares; they were in most cases associated with burnt tree roots, and were limited to upper soil horizons. Some artefacts that were observed to have been affected by heat were most likely affected by these post-depositional impacts.

Naturally occurring colluvial latite pebbles were evident in TS 1A and 1B at 50-58 centimetres depth. No cultural material was recovered in association with these rocks. Other areas did not contain latite gravel and rocks. Some fill material was encountered in TS 13 to 32 centimetres depth above natural grey sand.

One charcoal feature was identified in TS 10C between 44 and 48 cm depth. It consisted of a circular cluster of charcoal fragments and two *in situ* artefacts located outside of this feature. The feature was separately excavated and sieved, with a total of 8 artefacts recovered including one large possible manuport. No other cultural material or features were noted.

One burning event was evident in TS 19 but no cultural material could be associated with it. It was considered to be a remnant of a natural event.

The soil profiles revealed deep fine sandy sediments, with few inclusions present (Plate 30, 31 and 33). Grey organic sand was present up to 40cm depth occasionally mottled with underlying pale light orange grey sand occurring to an average of 70cm. Slightly darker orange brown sand was encountered at the base of test squares at 1 metre. At the southern section of the study area two test squares (TS 21 and 22) revealed somewhat different soil profiles with deposits having more consistent brown sands that extended from 40cm to the base level of 1 metre.



Plate 34. DLS Boral AFT 1 – TS1A, west section

- I. 0-12cm: Pale grey sand, humic. Frequent fine root systems.
- II. 12-31cm: Pale grey sand. Infrequent charcoal fragments inclusions. Diffuse boundary to:
- III. 31-58cm: Pale brownish grey sand. Small latite gravel and large colluvial latite cobbles from 50-58cm. Some charcoal flecks scattered. Diffuse boundary to:
- IV. 58-70cm: Dark brownish red sand becoming dark orange brown towards the base. Increasing moisture
- V. Base: Dark orange brown sand .



Plate 35. DLS Boral AFT 1 – TS 10C, south section

- I. 0-12cm: Reddish grey weak sand, humic, organic. Frequent fine root systems throughout. Diffuse boundary to:
- II. 12-47cm: Grey sand mottled with some pale orange sand. Bioturbated. Charcoal flecks and fragments scattered from 44 to 49cm. Diffuse boundary to:
- III. 47cm-base: Orange brown sand. Becoming slightly darker towards the base.
- IV. Base: Dark orange brown sand.



Plate 36. DLS Boral AFT 1 – TS10C charcoal feature, facing south.

- I. Charcoal feature at 44cm depth and two artefacts *in situ*



Plate 37. DLS Boral AFT 1 - TS 21, north section

- I. 0-10cm: Light grey loamy sand, humic. Frequent fine root systems throughout. Diffuse boundary to:
- II. 10-25cm: Light grey sand. Charcoal flecks scattered. Some roots inclusions. Clear boundary to:
- III. 25-35cm: Light pinkish grey soft. Some occasional flecks scattered. Diffuse boundary to:
- IV. 35-base: Yellowish brown sand, moist.
- V. Base: Yellowish brown sand.

6.3.3 Artefact Distribution

A total of 828 artefacts were recovered from 28 test excavation units at Stage 5B within the beach ridge landform and site DLS Boral AFT 1 (AHIMS 52-5-0907). Artefact densities for test squares are shown in Table 8 and Figure 8.

Table 8. Test excavation artefact densities at site DLS Boral AFT 1

Test Square	Total	Test Square	Total	Test Square	Total
1A	44	9A	10	17	78
1B	40	9C	6	18	19
2A	11	10A	22	19	31
2B	26	10C	40	20	43
3	1	11	2	21	75
4	2	12	1	22	46
5	33	13	9	23	103
6	5	14	3	24	10
7	70	15	5		
8	23	16	70		

Artefact distribution within DLS Boral AFT 1 site was characterised by variable density deposit (Table 8). All test squares exhibited Aboriginal objects. Two test squares had one artefact each (TS 3 and TS 12), and two test squares had two artefacts each (TS 4 and TS 11). High and low density areas varied across the tested landform. This variation in artefact density was not associated with previous ground disturbance, however a pattern of occupation could not be established at this time. It is possible that the high density areas represent separate occupational deposits from possibly different times during the year, or they represent repeated occupation throughout prolonged periods of time. Low artefact densities were recorded within the central-east section along the margins of the estuary and within a small patch to the south-west of the pond (Figure 8). Areas of the highest artefact density were located from about 20 metres south of the pond within the middle section of the beach ridge. Test square 23 had the highest (extrapolated) mean artefact density with 412/m², followed by TS 17 (312/m²) and TS 21 (300/m²). TS 16, located 20 metres north-west of TS 21, also revealed a high (extrapolated) mean artefact density (280/m²). TS 7 with the same number of artefacts as TS 16 possibly represents a separate occupation or targeted activity event, as the surrounding test pits revealed much lesser artefact density. Extrapolated to square metres, the test area displayed a mean artefact density of 118.3/m².

Artefact densities for the test squares are shown in Table 9 and Figure 8.

Table 9. Spit depths and artefact count

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Total
1A				7	9	28					44
1B			9	1	17	8	5				40
2A		1	7	1		1			1		11
2B			3	14	9						26
3				1							1
4			1			1					2
5		4	2	12	15						33
6					4	1					5
7				2	5			63			70
8			1	1	18	1	2				23
9A		1	1		3		4	1			10
9C					2	1	2	1			6
10A	2	6	4	1	1	1	7				22
10C	7	10		1	18		3	1			40
11	2										2
12	1										1
13			1	1	5	2					9
14		1		2							3
15		1	3		1						5
16		1		3	20	43	3				70
17		4	2	10	9	17	32	4			78
18		1		4	1	6	4	3			19
19	7	10	6		5				3		31
20	9	1	2	3	11	15	2				43
21			2	5	20	8	34	4	2		75
22			23	5	8	7	2	1			46
23	1	1	6	5	8	27	33	17	4	1	103
24			1		9						10
Total	29	42	74	79	198	167	133	95	10	1	828

The majority of artefacts displayed a classic bell curve were found from 40 to 70 cm depth (n=499, 60%), followed on either side of the bell curve between 70 and 80cm (n=95, 11%) and between 30 and 40cm (n=79, 9.5%) (Table 9). The highest number of artefacts was recorded within the orange brown sand deposits. The topsoil grey sands (to an average of 40 centimetres) contained 224 artefacts (27%), and the darker orange brown sand deposits encountered at an average of 80 centimetres contained less than 2% of the entire assemblage. These results indicate that the majority of the cultural material is preserved within the subsoil sandy horizon that represents intact and stable soils. Although artefact numbers decrease from 80 centimetres depth, they are still recovered from as deep as 1 metre. Considering that the same sandy matrix that contains artefacts is continuing to levels deeper than 1 metre, it is still possible that some cultural material could occur in the area within these deeper sandy deposits; however the current program identified no evidence of deep cultural deposits.

One artefact was recovered from the top 13 centimetres within the fill material in TS 13, and it was included in this assemblage, although its provenance could not be established.

The charcoal feature recorded between 44 and 48cm depth within TS 10C (Plate 32) was less than 10 centimetres in diameter, consisting of charcoal flecks with two *in situ* artefacts recorded outside of this feature, and an additional five artefacts recovered from the sieves with one possible manuport. Considering the small size of the feature and its location within topsoil layers it is most likely that it does not represent a cultural feature.



Figure 8. Stage 5B test square locations and artefact density in DLS Boral AFT 1.

6.3.4 Lithics

The dominant raw material for Stage 5B artefacts was silcrete (n=202, 24%), followed closely by a similar representation of quartz (n=120, 14%), jasper (n=115, 13.8%) and chert (n=99, 12%). A range of other raw material was recorded including unidentified fine and medium grained siliceous (FGS and MGS), chalcedony and petrified wood, agate, quartzite and coarse silcrete, and a very small percentage (less than 1%) of sandstone and igneous raw material was included in the assemblage (Table 12).

Artefacts were generally small, with the majority between 5 and 9 millimetres (Table 6). Artefacts greater than 29mm were scarce and comprised 4% of the entire assemblage. The largest artefact was an angular fragment of MGS between 100 and 104 millimetres recovered from TS 22 from between 20 to 30 centimetres depth. Artefacts measuring between 5 and 24 millimetres had the greatest variety of raw material present.

The majority of artefacts were flake debitage (Table 7). Non-diagnostic flaked angular fragments were the most common artefact type overall, accounting for 53.7% of the assemblage (n=223). Complete flakes were represented by 27% (n=223), with flake fragments (proximal, medial, distal, and split) making up 15.5% of the assemblage. Cores were not abundant in the assemblage (n=28, 3.3%), with chert being the most preferable raw material (n=11, 29%). Chalcedony, silcrete and FGS were more frequently chosen over jasper, quartz and quartzite and petrified wood. This preference might stem from the fact that chert is readily available in the area, and the finer, chalcedony varieties were more valued and preserved. A petrified wood core with a great amount of cortex was identified in TS 17 from 30 to 40 centimetres depth. The same spit contained an additional four flake fragments (Plate 38) that could have come off the core, indicating that a knapping event most likely took place in the area.



Plate 38. Petrified wood core and flake fragments (ID 431-435), TS 17, spit 4.



Plate 39. Artefacts variety at TS 23, petrified wood, silcrete, jasper, chert and chalcedony.

An unidentified rock fragment was recovered from TS 10C in association with the charcoal feature. It did not display any diagnostic features nor traces of modification, such as pecking or flaking. However, considering the raw material is not known to source in the local area, it most likely has been brought to the area. It was referred to as manuport and is not considered further in the lithics analysis.

Test Square 23 revealed the highest number and the greatest variety of raw material present. Silcrete comprised almost 50% of all occurring raw material and was recorded throughout all soil layers. Layers deeper than 50 centimetres contained a greater number and range of artefacts, including five backed artefacts. Only two artefacts contained a small amount of cortex, indicating that knapping was not occurring at this section of the site.

Table 10. Raw material distribution within DLS Boral AFT 1.

Raw Material	0-4mm	5-9mm	10-14mm	15-19mm	20-24mm	25-29mm	30-34mm	35-39mm	40-44mm	45-49mm	50-54mm	55-59mm	64-69mm	100-104mm	Total
Agate		8	4	5	2										19
Chalcedony	1	23	22	18	3	2	1								70
Chert	1	37	22	20	10	8		1							99
Coarse silcrete		3	2	1	2	1	2	1							12
FGS		21	23	18	7	2	2		1	1		1			76
Igneous		1	1	1	1	1	1				1				7
Jasper	2	52	26	24	2	4	4	1							115
MGS	5	24	12	9	6	2			1					1	60
Petrified Wood		7	12	6	2	4	1	3							35
Quartz	4	51	39	24	1				1						120
Quartzite		1	4	5	1			1							12
Sandstone													1		1
Silcrete	8	83	46	28	14	15	1	5	2						202
Total	21	311	213	159	51	39	12	12	5	1	1	1	1	1	828

Table 11. Reduction types at DLS Boral AFT 1.

Raw Material	Flake	Proximal Fragment	Distal Fragment	Split Fragment	Medial Fragment	Angular Fragment	Core	Hammerstone	Ground stone
Quartz	31	2	1	3		81	1	1	
Quartzite	1	2	3	1		4	1		
Chalcedony	22	6	6	3	1	27	4		
Chert	36	6	6	8	2	31	11		
FGS	11	3	5	2	2	48	5		
MGS	11	1			1	47			
Petrified Wood	10	2	3	1		18	1		
Igneous	1		1	1	1	3			
Jasper	31	5	5	4		68	2		
Agate	3			2		14			
Sandstone									1
Silcrete	62	8	17	7	7	98	3		
Coarse silcrete	3	1	2			6			
Total	222	36	49	32	14	445	28	1	1

Cortex was relatively infrequent at DLS Boral AFT 1. It was recorded on 48 artefacts, representing 13.6% of the entire assemblage (Table 12). Artefacts made of sandstone and MGS did not display any cortex. Quartz was the raw material that contained the highest frequency of cortex (n=32, 28.3%). Surfaces of 1-30% cortex were recorded on 78 artefacts (69%), with only seven artefacts having >70% of cortex. The results indicate that most likely dispersed knapping events occurred throughout the site at different locations and at most likely different times.

Table 12. Presence of cortex in relation to raw material and artefact types, at DLS Boral AFT 1.

	0%	1-30%	31-69%	>70%	Total
Agate	16	2		1	19
Chalcedony	62	4	3	1	70
Chert	84	11	4		99
Coarse silcrete	8	3	1		12
FGS	69	5	2		76
Igneous	5	2			7
Jasper	103	9	3		115
MGS	60				60
Petrified Wood	28	5	2		35
Quartz	88	25	5	2	120
Quartzite	9	2		1	12
Sandstone	1				1
Silcrete	182	10	8	2	202
Total	715	78	28	7	828

	0%	1-30%	31-69%	>70%	Total
Core	15	7	6		28
Flake	198	22	2		222
Proximal Fragment	31	3	2		36
Distal Fragment	45	3	1		49
Split Fragment	27	3	2		32
Angular Fragment	384	40	15	7	446
Medial Fragment	14				14
Pebble	1				1
Total	715	78	28	7	828

Coarse silcrete was of particular interest as it was identified in three excavation units, mainly from spit 6. Four flaked fragments had cortex, and were on average 25mm, displaying slightly greater size than the most of the artefacts within the assemblage (Plate 40). Test square 16 contained 8 artefacts, and although a core was not recovered at this location, the presence of flaked fragments with cortex indicates the possibility that a knapping floor could be encountered in this portion of the site. The same pattern was observed in TS 17 with two flaked fragments containing cortex found at the same depth. These could indicate two discrete knapping floor events, possibly around a similar time periods.



Plate 40. Coarse silcrete flake fragments with cortex (ID 384, 385) TS 16, (ID 460, 461) TS 17, spit 6.



Plate 41. Backed artefacts at TS 17 – spit 6: chalcedony, chert and jasper (ID 464, 472, 478).

A total of 38 tools and modified artefacts were recovered at DLS Boral AFT 1 (Table 15), occurring across the entire tested area. TS 23 had the highest number of modified artefacts, consisting of silcrete, chert and petrified wood backed flake fragments, ranging from 30 to 80 centimetres depth. Five backed blades were recovered in total, three from TS 17 (Plate 41). Geometric microliths were made of finer siliceous raw material, petrified wood and chalcedony varieties of jasper and agate (Plate 42).

Table 13. Tools and modified artefacts

Tool Type	Backed blade	Retouched	Geometric microlith	Usewear	Ground stone fragment	Hammerstone
Chalcedony	2			2		
Chert	2	5				
Petrified Wood	1	3	2			
Agate			1			
Jasper		2	1	3		
FGS		1	2			
Quartz		1				1
Silcrete		6		2		
Sandstone					1	
Total number	5	18	6	7	1	1

One weathered sandstone fragment (Plate 41) was found in spit 7 of TS 10C that exhibited smooth, ground surfaces with some pecking. Its use could not be determined due to the lack of diagnostic features, but its flat bottom indicates its possible use as an anvil.



Plate 42. Jasper backed artefact, petrified wood backed blade and agate geometric microlith (ID 356, 333 and 61) **Plate 43. Sandstone ground stone (ID 331), TS 10C, spit 7.**

Some artefacts revealed signs of being affected by heat. These artefacts were confined to the upper 50 centimetres and are most likely associated with bushfire events and burning that extended to tree roots. Therefore, heat damage is most likely post-depositional impact, and not the result of a deliberate act, as no clear evidence of hearths was encountered. The local latite which outcrops in the area is not fine grained or durable enough for stone tool use and all artefact raw materials uncovered by the test excavation program had to be brought in to the area. Agates can occur as nodules formed in gaseous cavities of volcanic rocks and are known to be found in gravels along the coast to the north of Dunmore, in the vicinity of Shellharbour and Bass Point. Examples of artefacts recovered during the test excavation program with smooth cobble cortex suggest these were sourced in stream gravels, from coastal gravels, or possibly from breccia deposits associated with igneous intrusions.

Most of the artefacts were of good quality isotropic stone, with zero cortex, and small in size (<19 millimetres) suggesting that artefact raw materials were being conserved. The only raw material that was possibly sourced or brought to the site to be modified is coarse silcrete. Results of test excavation indicate that primary reduction processes were occurring at the site. The presence of a high number of backed artefacts suggests that some particular activities were also taking place across the site. No worn margins and a silica-gloss patina consistent with natural wearing of the surfaces through water action were noted. Artefacts revealed stable and relatively intact soil conditions indicating their primary context.

6.4 Discussion

The test excavation of the study area identified three Aboriginal archaeological sites:

- DLS Boral AFT 1
- DLS Boral AFT 2
- DLS Boral AFT 3

Test squares averaged 80 centimetres to 1 metre in depth, with two excavation units excavated to 1.2 metres. Two tested areas lie within different landform elements but are part of the same coastal barrier land system with similar geomorphological deposition processes. Generally, both areas contain a stable, sandy soil matrix that is the result of successive periods of storm deposition or dune accretion over long geological time scales. As such, the soils become inactive and represent relict features that are prone to conserving archaeological subsurface material in its primary context. Soils across the study area contained deep sandy deposits that extended beyond the limit of excavation however all identified deposits show a bell curve trend of minimal archaeology below 80cm (only <0.3% of recovered artefacts at 90cm).

Artefact distribution was characterised by high artefact density deposits encountered throughout the tested area. Some patchy low density areas were localised towards the margins of the sand bodies. The highest artefact density was recorded within the central, most elevated parts of the sand beach ridge and backbarrier flat. DLS Boral AFT 1 did not reveal evidence of significant previous ground disturbances that could have impacted on subsurface archaeological deposits. The only previous disturbance was evident within very shallow surface soils due to repeated natural fire events and land clearing. These land use practices and natural events would cause some horizontal and shallow vertical movement of archaeological deposit, but would not remove it in its entirety. In addition, these disturbances are patchy and were not identified in all test excavation units. The majority of the site is within very stable intact sandy deposits. DLS Boral AFT 2 had some areas that revealed imported fill deposits up to 35 centimetres depth. These were limited to the southern and western sections of the sand body. Natural sandy deposits are still present under fill material containing high to low density Aboriginal cultural material.

Flaked artefacts were made of a diverse range of stone raw materials. This included agate, chalcedony, chert, quartz, quartzite, jasper, silcrete, petrified wood, unidentified fine and mid grained siliceous, tuff and igneous rock. Sources of these raw materials are known in the immediate vicinity of the test excavation areas, within Shellharbour and Bass Point, located approximately 5 kilometres from the study area. The predominantly small size of artefacts and evidence of artefact recycling indicate that the materials were brought to the area from elsewhere (perhaps from sources along the nearby Minnamurra River). Some knapping was also occurring at dispersed locations and most likely different times throughout the site. The presence of backed artefacts indicates particular and selective activities.

The results of the test excavation program demonstrate that DLS Boral AFT 1 and DLS Boral AFT 2 have moderate-high archaeological research potential due to the high number and diversity of raw material and tool types, relatively intact nature of the subsurface deposit at these locations and their proximity to estuarine environments. DLS Boral AFT 3 has low archaeological research potential due to the low density of artefacts recovered and the disturbed nature of the site.

6.5 Conclusion

Aboriginal sites identified within the Stage 5A and 5B areas reflect both the preference for occupation and the survivability of archaeological deposit in these intact landforms. Estuary environments were extensively used by Aboriginal people in the past, and elevated, well drained and sandy locales would have served as preferable camping locations. The elevated location was selected for its topographic nature and its position adjacent to a variety of resources associated with the Minnamurra River estuary. Beach ridge and back barrier flat were most likely focal points in the landscape where Aboriginal people performed a variety of tasks associated with the everyday and specialised activities. Considering the nature of these landforms, they were also subject to repeated and frequent occupation, resulting in accumulation of cultural material from different times and stemming from diverse activities.

7 Identified Aboriginal Sites

Aboriginal cultural heritage assessment, including review of previous archaeological investigations, Aboriginal community consultation and test excavation has identified three Aboriginal archaeological sites within the study area (Figure 9). These sites comprise three artefact scatters and are listed in Table 14.

Table 14. Identified Aboriginal cultural heritage values within the study area

Site Name	AHIMS #	Site Feature
DLS Boral AFT 1	52-5-0907	Artefact
DLS Boral AFT 2	52-5-0908	Artefact
DLS Boral AFT 3	52-5-0909	Artefact

DLS Boral AFT 1

Site DLS Boral AFT 1 was located within the beach ridge landform within the proposed Stage 5B area, to the immediate south of the natural pond and the small drainage line. Test excavations determined that the site extends throughout the entire landform and contains relatively intact high density archaeological deposits. A total of 828 artefacts were excavated from 28 50x50cm excavation units.

Artefact density within the test excavation area, extrapolated to square metres, displayed a mean of 118.3/m². Artefact distribution was characterised by high density deposits with a localised low density towards the margins of the sand body. The majority of the artefacts were recovered between 40 and 70 centimetres depth. They were preserved within the subsoil orange brown sandy horizon that represents relatively stable soils, most likely intact and not related to geomorphic processes. The quality and aesthetic nature of the raw material indicated a selective activity area. Results of test excavation indicate that the area contains evidence of dispersed and varied occupation activities that occurred during a prolonged period of time and on repeated occasions.

DLS Boral AFT 2

Site DLS Boral AFT 2 was located within the back barrier sand body within Stage 5A study area, adjacent to the tidal flat in association with the estuary of the Minnamurra River. Test excavation determined that the site retained an intact, high density archaeological deposit located across the entire remnant sand body. A total of 461 artefacts were recovered from 12 50x50cm test units.

Artefact density within the test excavation area was similar to within DLS Boral AFT 1 and extrapolated to square metres, the test area displayed a mean artefact density of 115.3/m². Artefact distribution was characterised by a moderate to high artefact density across all excavated test units. Localised low density was recorded along the margins of the landform that indicates the site boundary. The highest artefact density was recorded within the central elevated section of the sand body. Some surface fill material was identified within the first 35 centimetres that did not impact on integrity of deeper sandy archaeological deposits. The assemblage contained a small quantity of cores and formalised tools indicating that the creation of stone tools occurred at the site but was secondary to the maintenance and use of stone tools. The quality and aesthetic nature of the raw material indicated a selective activity area.

DLS Boral AFT 3

Site DLS Boral AFT 3 was located within the artificially raised area to the immediate west of Riverside Drive. It is located between the tidal flat and back barrier flat landforms. Test excavations determined that the raised area is made of fill material. This fill was most likely brought into the area during the construction of the road and the modification of a small drain that runs parallel to Riverside Drive. A total of three artefacts were recovered from three test pits.

They consisted of two quartz angular fragments, and one quartz retouched flake. It is possible that they were brought in with the fill material or they represent dispersed/disturbed isolated cultural material from the local area. No further cultural material was identified and the entire raised area was considered to have very low archaeological potential for intact deposits.

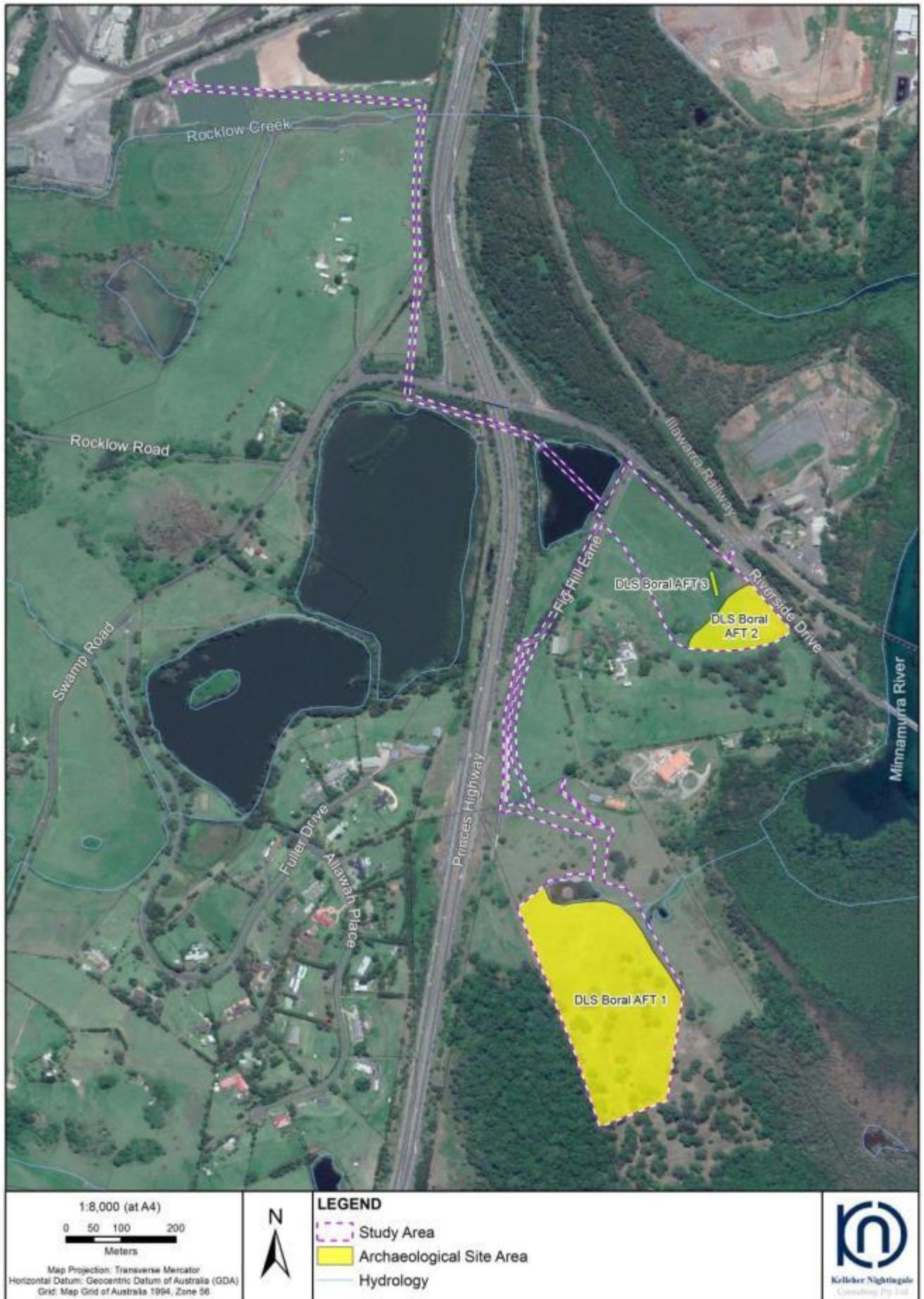


Figure 9. Identified Aboriginal archaeological sites in the study area

8 Cultural heritage values and statement of significance

8.1 Significance assessment criteria

One of the primary steps in the process of cultural heritage management is the assessment of significance. Not all sites are equally significant and not all are worthy of equal consideration and management (Sullivan and Bowdler 1984, Pearson and Sullivan 1995:7). The determination of significance can be a difficult process as the social and scientific context within which these decisions are made is subject to change (Sullivan and Bowdler 1984). This does not lessen the value of the heritage approach, but enriches both the process and the long-term outcomes for future generations, as the nature of what is conserved and why, also changes over time.

Significance assessments can generally be described under three broad headings (Pearson and Sullivan 1995:7):

- value to groups such as Aboriginal communities;
- value to scientists and other information gatherers; and
- value to the general public in the context of regional, state and national heritage.

The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH 2010b) requires significance assessment according to criteria established in the *Australia ICOMOS Burra Charter* (Australia ICOMOS 2013). The *Burra Charter* and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the *Burra Charter* set out four criteria for the assessment of cultural significance:

- Aesthetic value - relates to the sense of the beauty of a place, object, site or item;
- Historic value - relates to the association of a place, object, site or item with historical events, people, activities or periods;
- Scientific value - scientific (or research) value relates to the importance of the data available for a place, object, site or item, based on its rarity, quality or representativeness, as well as on the degree to which the place (object, site or item) may contribute further substantial information; and
- Social value - relates to the qualities for which a place, object, site or item has become a focus of spiritual, political, national or other cultural sentiment to a group of people. In accordance with the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*, the social or cultural value of a place (object, site or item) may be related to spiritual, traditional, historical or contemporary associations. "Social or cultural value can only be identified through consultation with Aboriginal people" (OEH 2011:8).

Significance assessment for identified archaeological sites focusses on the social/cultural, historic, scientific and aesthetic significance of Aboriginal heritage values as identified in *The Burra Charter* (Australia ICOMOS 2013). The identification of significance is developed in consultation with the registered Aboriginal stakeholders. Assessed values for the site within the study area are detailed below.

Cultural / social significance

This area of assessment concerns the value(s) of a place, feature or site to a particular community group, in this case the local Aboriginal community. Aspects of social significance are relevant to sites, objects and landscapes that are important or have become important to the local Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal people for sites generally and their continued protection. Aboriginal cultural significance may include social, spiritual, historic and archaeological values and is determined by the Aboriginal community.

It has been identified during the consultation process that the local area has high cultural heritage value (social value) to the local Aboriginal community. Cultural or social values provided by the registered Aboriginal stakeholders are discussed in Section 2.

Historic significance

Community consultation and historical research has not identified any information regarding specific historical significance of identified Aboriginal archaeological sites in or near the study area. No specific historical significance for the sites within the project area were provided by the registered Aboriginal stakeholders following the review of the draft CHAR. Archaeologically, the study area does not contain these values in relation to Aboriginal heritage.

Scientific / archaeological significance

For archaeologists, scientific significance refers to the potential of a site to contribute to current research questions. Alternately, a site may be an in situ repository of demonstrably important information, for example rare artefacts of unusually high antiquity.

Scientific significance is assessed using criteria to evaluate the contents of a site, state of preservation, integrity of deposits, representativeness of the site type, rarity/uniqueness and potential to answer research questions on past human behaviour. OEH's recommended criteria for assessing archaeological significance include:

- Archaeological Research Potential - significance may be based on the potential of a site or landscape to explain past human behaviour and can incorporate the intactness, stratigraphic integrity or state of preservation of a site, the association of the site to other sites in the region (connectivity), or a datable chronology.
- Representativeness - all sites are representative of those in their class (site type/subtype) however the issue here relates to whether particular sites should be conserved to ensure a representative sample of the archaeological record is retained. Representativeness is based on an understanding of the regional archaeological context in terms of site variability in and around the study area, the resources already conserved and the relationship of sites across the landscape.
- Rarity – which defines how distinctive a site may be, based on an understanding of what is unique in the archaeological record and consideration of key archaeological research questions (i.e. some sites are considered more important due to their ability to provide certain information). It may be assessed at local, regional, state and national levels.

High significance is usually attributed to sites which are so rare or unique that the loss of the site would affect our ability to understand an aspect of past Aboriginal use/occupation of an area. In some cases a site may be considered highly significant because it is now rare due to destruction of the archaeological record through development. Moderate (medium) significance is attributed to sites which provide information on an established research question. Sites with moderate significance are those that offer the potential to yield information that will contribute to the growing holistic understanding of the Aboriginal cultural landscape of the project area. Archaeological investigation of moderately significant sites will contribute knowledge regarding site type interrelationships, cultural use of landscape features and occupation patterns. Low significance is attributed to sites which cannot contribute new information about past Aboriginal use/occupation of an area. This may be due to site disturbance or the nature of the site's contents.

Aesthetic Values

Aesthetic values are often closely related to the social values of a site or broader cultural landscape. Aspects may include scenic sights, smells and sounds, architectural fabric and creative aspects of a place. No specific aesthetic values for identified sites within the study area have been identified by registered Aboriginal stakeholders to date. No aesthetic values were provided by the registered Aboriginal stakeholders following the review of the draft CHAR. Archaeologically, the study area does not contain these values in relation to Aboriginal heritage.

8.2 Statements of significance

The study area has cultural value for the local Aboriginal community. The identified cultural value is a feeling of attachment and responsibility for the land. These values become tangible when tied to identified Aboriginal objects found at the archaeological sites. In this way, the Aboriginal objects can be seen as exhibiting both scientific information and cultural meaning, knowledge about the past tied with social values and belief systems.

The study area contained three identified Aboriginal archaeological sites as defined under the *National Parks and Wildlife Act 1974*. Significance assessment was based on consideration of the research value, representativeness, intactness and rarity of the sites in a local and regional context as outlined below.

DLS Boral AFT 1

Site DLS Boral AFT 1 was a high density artefact scatter located within the remnant beach ridge landform adjacent to the Minnamurra River estuary. The site had been subject to limited human disturbance and the results from the test excavation suggest that movement within the deposit was also limited. The site represents a commonly occurring site type in the coastal region; however recorded intact (coastal) sites are becoming less common as the majority of landforms in similar environmental settings are increasingly impacted by contemporary land use practices.

The range of raw material and artefact types found at the site and stratified context adjacent to an estuarine environment is less common. The site demonstrated moderate-high scientific value and it is likely that further investigation will contribute to the understanding of Aboriginal landscape use within coastal areas and assist in understanding the management of coastal sites and identification/conservation of future sites based on geomorphic features (beach ridge).

Based on the intactness, representativeness, and research potential of the site, DLS Boral AFT 1 was determined to have moderate-high archaeological significance.

DLS Boral AFT 2

Site DLS Boral AFT 2 was a high density artefact scatter located within the remnant back barrier flat landform adjacent to the Minnamurra River estuary. The site had been subject to some recent land modifications and the results from the test excavation suggest that limited areas experienced importing of some fill material. Generally, this did not impact on the majority of the artefact-bearing sandy deposits. The site represents a commonly occurring site type in the region; however the majority of landforms in similar environmental settings have been significantly impacted by recent land use practices. The range of raw material and artefact types found at the site and stratified context adjacent to the estuarine environment is less common. The site demonstrated moderate-high scientific value and it is likely that further investigation will contribute to the understanding of Aboriginal landscape use within coastal areas and assist in understanding the management of coastal sites and identification/conservation of future sites based on geomorphic features (back barrier sands).

Based on the intactness, representativeness, and research potential of the site, DLS Boral AFT 2 was determined to have moderate-high archaeological significance.

DLS Boral AFT 3

Site DLS Boral AFT 3 was a low density artefact scatter situated with a highly disturbed area. The site is located within fill material with an absence of natural soils. The site represents a commonly occurring site type in the region. The site demonstrated no scientific value due to the disturbed nature and low density of the archaeological deposit. Further investigation will not contribute to the understanding of Aboriginal landscape use in the region.

Based on the intactness, representativeness and research potential of the site, DLS Boral AFT 3 is determined to have low archaeological significance.

9 Proposed activity and impact assessment

DSS is seeking approval for a modification to their existing development consent (DA 195-8-2004) for Stages 2 to 4 of the Dunmore Lakes Sand Project at Dunmore. The proposed modification is for a new extraction stage (Stage 5) on adjoining land and would be a S75W modification to the existing consent. The proposed new extraction stage is required to enable the continuation of the current sand extraction operations. The entirety of the study area will be impacted by the proposed modification and associated activities.

The three identified Aboriginal sites would be impacted by the proposal. Assessed impacts to sites identified within the study area are detailed in Table 7.

Table 15. Aboriginal heritage impacts

Site Name	AHIMS ID	Type of harm	Degree of harm	Consequence of harm	Significance of harm
DLS Boral AFT 1	52-5-0907	Direct	Total	Total loss of value	High
DLS Boral AFT 2	52-5-0908	Direct	Total	Total loss of value	High
DLS Boral AFT 3	52-5-0909	Direct	Total	Total loss of value	Low

Cumulative impact

Review of background information indicates that 29 Aboriginal archaeological sites are registered on the AHIMS database in the vicinity of the study area (32 sites counting the three registered as a result of the current assessment). The number of recorded sites in the vicinity of the study area is a reflection of the extent of previous archaeological investigations and does not necessarily reflect the true frequency (or rarity) of Aboriginal archaeological sites. Identified sites occur on a variety of landforms and reflect various Aboriginal landscape uses.

General assumptions that stem from the results of previous assessments in the estuarine environment point out that various sedimentation processes associated with the infilling of the estuary and the aggrading nature of lower slopes may have resulted in covering of the archaeological sites, resulting in potential stratification and preservation of deposits. Toeslopes and elevated surfaces such as terraces around the margins of estuaries and floodplains have been identified as particularly high value. Previous site recordings suggest that higher density, more intact deposits are located in these areas. In contrast, within lowland areas along watercourses and the present-day active alluvial and swamp plains, higher levels of disturbance from flooding, active soil cycling and more concentrated modern land use have generally negatively impacted archaeological context. DLS Boral AFT 3 is typical of disturbed sites recorded in this environment, comprising a disturbed and low density deposit devoid of meaningful archaeological context.

Sites DLS Boral AFT 1 and DLS Boral AFT 2 are typical of sites recorded in the more sensitive environmental context. Impact to the sites would increase the ongoing cumulative impact occurring to Aboriginal heritage in the wider region as a result of development and modern land use. However, impact to the sites would represent only a small cumulative impact to the recorded archaeology of the local area, which is likely much more extensive than what is present on AHIMS. Archaeological deposits similar to DLS Boral AFT 1 and DLS Boral AFT 2 will be located in undisturbed barrier sand deposits, in proximity to subaqueous bedrock and along fresh water channels from the Shoalhaven River up the Illawarra coastline.

The spatial extent, presence of archaeological deposits and activities related to Aboriginal occupation at archaeological sites in the surrounding area are not yet fully understood due to limited subsurface archaeological investigations. Previous recordings have identified numerous sites within and along the margins of the former coastal barrier and estuarine sand bodies of the lower Minnamurra River and estuary (e.g. AHIMS 52-5-0072, 52-5-0117, 52-5-0451, 52-5-0159, 52-5-0241, 52-5-0243, 52-5-0167, 52-5-0168, Navin Officer 2000). These vary in site contents and context. High value archaeological sites are likely to occur widely where suitable landforms and environmental conditions occur. The test excavation program has demonstrated that stable, intact (aggrading) soils on sand bodies can preserve intact and potentially stratified archaeological deposit.

The proposed salvage program would reduce the harm of the identified cumulative impact by increasing our understanding of how such sites may be better identified, investigated and managed within the complex environment of the lower Minnamurra River. Potential conservation outcomes for future projects would also be strengthened, particularly as the information gained would be directly applicable at the early concept stage to other identified sites within similar sand bodies in the local area and wider region. Improved identification and understanding of archaeological survivability principles with the barrier sand will allow for early appreciation and informed impact assessments and potential conservation outcomes.

10 Avoiding and/or mitigating harm

The three Aboriginal archaeological sites identified within the study area have been considered by DSS in relation to the proposed extraction pit expansion. While conservation is the best approach when considering Aboriginal heritage, impact to the three sites is unfortunately unavoidable due to the nature of the expansion project. The most significant sites are situated within the areas of proposed impact; however it should be noted that the overall project footprint was reduced from the original concept to minimise environmental impacts.

Avoidance

The configuration of the proposed extraction pits has been developed having regard to the constraints of the land, the desire to mitigate and avoid impacts where possible, whilst balancing the commercial viability of the proposal, and the extent of known resource.

Reductions in the proposed extraction area would result in a loss of identified sand deposits, which are a fundamental resource for the construction market in not only NSW, and will result in an impact on the overall availability of sand in the state more generally.

A study into the supply and demand profile of construction materials for the greater Sydney region commissioned by the DP&E identified that under current approvals, there are insufficient reserves of natural sand to meet the demand for natural sand products in the Sydney region to 2036. The study also noted that there are sufficient potential resources that could be developed adjacent to or within existing quarries to meet the cumulative demand for natural sand products.

The Modification seeks to capitalise on sand availability adjacent to the existing operations, maximising output from existing production facilities and capitalising on existing rail transport options. This in turn results in a smaller disturbance footprint and minimises environmental impacts.

The consideration of separation distances would also apply to the areas directly abutting the proposed extraction area within the allotment, as the proposed extraction footprint has been substantially reduced from the original concept in the interests of minimising environmental impacts and removal of vegetation.

Mitigation

The scientific value of archaeological sites is linked to the physical information the sites contain. Site DLS Boral AFT 3 has low archaeological significance and does not warrant further archaeological investigation; however, measures for mitigating harm to Aboriginal objects (salvage excavation) are recommended for sites DLS Boral AFT 1 and DLS Boral AFT 2.

The loss of intrinsic Aboriginal cultural value of impacted sites cannot be offset; however the salvaged information will increase our understanding, strengthen our interpretations and improve ongoing and future management of Aboriginal heritage in the surrounding area. The presence of archaeological deposits and activities related to Aboriginal occupation within coastal barrier landform contexts in association with estuaries is little known due to limited large excavation data, and the levels of previous disturbance in these environmental conditions within the Illawarra Coastal Plain. In this light, the project offers a unique opportunity to significantly advance the interpretation and management of Aboriginal heritage of the surrounding area by providing a foundation for future heritage assessments.

Management measures should also be implemented for adjacent areas (outside of proposed impact zone). Aboriginal objects are known to occur in adjacent landforms and these must be avoided by all proposed extraction activities. Management measures to be implemented should include clear fencing of the boundary of the approved impact zone and the inclusion of Aboriginal heritage in the Environmental Management Plan (EMP). Documented toolbox talks will also be held to ensure all on-site staff and contractors are aware of obligations and requirements regarding the protection of Aboriginal heritage.

11 Management and Recommendations – Dunmore Lakes Sand

The following management and mitigation measures are required for identified Aboriginal heritage within the Stage 5A and 5B expansion area. Management measures provide a process to manage Aboriginal cultural heritage impacts and mitigation works through the operation lifetime of the expanded extraction areas.

11.1 Mitigation through archaeological salvage excavation

The archaeological sites in Table 16 are of moderate-high Aboriginal heritage significance and will be impacted by the project. These sites require archaeological salvage excavation to mitigate the impacts. Salvage excavation can only occur after approval for the modification to existing development consent DA 195-8-2004 is obtained and in accordance with the terms of that approval.

Salvage excavation must be completed prior to any activities which may harm Aboriginal objects at these site locations. Salvage excavation activities would be undertaken in accordance with the methodology attached as Appendix E. Salvage excavation may be completed in stages to suit the extraction program.

Table 16. Aboriginal sites requiring mitigation (salvage excavation)

Archaeological sites requiring mitigation	
Archaeological Sites (requiring salvage)	DLS Boral AFT 1 DLS Boral AFT 2

11.1.1 Archaeological Salvage Excavation Report

An Archaeological Salvage Excavation Report will be prepared to document the findings of the archaeological salvage excavation program. The report will:

- include an executive summary
- describe the methods and results of the salvage excavation program
- describe the ongoing consultation with and involvement of Registered Aboriginal Parties
- be completed with input and consultation with Registered Aboriginal Parties
- detail the results of the analysis of recovered Aboriginal objects
- detail the long term management of Aboriginal objects
- include a statement of compliance with modification approval conditions and management and mitigation measures, and
- confirm that Aboriginal Site Impact Recording Forms (ASIRFs) have been completed and submitted to the OEH AHIMS Registrar.

11.1.2 Salvaged Aboriginal objects

Salvaged Aboriginal objects will be managed at a temporary storage location for analysis and reporting purposes. Long term management of Aboriginal objects will be determined in consultation with Registered Aboriginal Stakeholders for the project.

The short term management of collected Aboriginal objects is as follows:

- Any Aboriginal objects that are removed from the land by actions authorised by the project approval, must be moved as soon as practicable to the temporary storage location (see below) pending any agreement reached about the long term management of the Aboriginal objects.
- The temporary storage location would be: Kelleher Nightingale Consulting Pty Ltd, Level 10, 25 Bligh Street, Sydney NSW 2000.
- Any Aboriginal objects stored at the temporary storage location must not be further harmed, except in accordance with the conditions of the approval.

The long term management of collected Aboriginal objects is as follows:

- Recovered objects will be lodged with the Australian Museum in the first instance in accordance with the *Australian Museum Archaeological Collection Deposition Policy* (January 2012, available online at: <http://australianmuseum.net.au/document/Protocols-for-the-deposition-of-archaeological-materials>). If required, a variation will be sought for recovered objects to be held by the Aboriginal community or reburied.
- Requirement 26 "Stone artefact deposition and storage" in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* must be complied with.

11.2 No archaeological mitigation required

No archaeological mitigation is required for the site in Table 17. The site may only be impacted after approval for the modification to existing development consent DA 195-8-2004 is obtained and in accordance with the terms of that approval.

Table 17. Aboriginal sites with no further archaeological mitigation required

No further archaeological mitigation required	
Archaeological Sites (no archaeological mitigation)	DLS Boral AFT 3

11.3 Aboriginal Site Impact Recording Forms

- **An Aboriginal Site Impact Recording Form will be completed following impacts to AHIMS sites authorised by the project approval.**

An Aboriginal Site Impact Recording Form (ASIRF) will be prepared and submitted to the AHIMS Registrar for each site, following impacts from actions authorised by the project modification approval. The Aboriginal Site Impact Recording Form is available online at: <http://www.environment.nsw.gov.au/resources/cultureheritage/120558asirf.pdf>

Where archaeological sites have been salvaged as part of the modification approval, the ASIRF will include a summary of the findings of the salvage program.

11.4 Procedures for Handling Human Remains

- **Note that Project or Modification Approvals do not include the destruction of Aboriginal remains**
- **Any potential human remains encountered will be protected and managed appropriately.**

This section outlines the procedure for handling human remains in accordance with the Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the *Heritage Act 1977* (NSW Heritage Office 1998) and the Aboriginal Cultural Heritage Standards and Guidelines Kit (NPWS 1997). In the event that construction activity reveals possible human skeletal material (remains), the following procedure is to be followed:

1. as soon as remains are exposed, all work is to halt at that location immediately and the Project environmental manager on site is to be immediately notified to allow assessment and management;
 - i. stop all activities;
 - ii. secure the site; and
 - iii. not further harm the remains.
2. contact police: the discovery of human remains triggers a process which assumes that they are associated with a crime. The NSW Police retain carriage of the process until such time as the remains are confirmed to be Aboriginal or historic;
3. DP&E, as the approval authority, will be notified when human remains are found;
4. once the police process is complete and if remains are not associated with a contemporary crime contact DP&E. DP&E will determine the process, in consultation with OEH and/or the Heritage Office as appropriate;
 - i. if the remains are identified as Aboriginal, the site is to be secured and DP&E and all Aboriginal stakeholders are to be notified in writing. DP&E will act in consultation with OEH as appropriate. OEH will be notified in writing according to DP&E instructions; or
 - ii. if the remains are identified as non-Aboriginal (historical) remains, the site is to be secured and the DP&E is to be contacted. DP&E will act in consultation with the Heritage Division as appropriate. The Heritage Division will be notified in writing according to DP&E instructions;
5. once the police process is complete and if the remains are identified as not being human work can recommence once the appropriate clearances have been given.

11.5 Unexpected Finds Procedure

- **Any unexpected Aboriginal heritage items (Aboriginal objects) will be managed appropriately.**

In the event that an unexpected find (Aboriginal object) is encountered the following procedure will apply:

1. Stop work and protect find area and report to environmental manager
2. Contact heritage advisor for identification
 - a. No further action if the find is not an Aboriginal object
 - b. If the find is an Aboriginal object proceed to next step
3. Undertake relevant regulatory requirements and contact with OEH/DP&E where required
4. Implement conservation or mitigation strategy
5. Obtain approval if required and comply with conditions
6. Recommence work

11.6 Heritage Training and Induction Process

- **Aboriginal heritage management procedures will be included in construction personnel training and induction processes.**

Aboriginal heritage management procedures and responsibilities for compliance will form part of the project induction for construction personnel (employees, contractors, subcontractors and/or agents). This will include site identification (including construction heritage site map) to ensure all personnel are aware of Aboriginal heritage management responsibilities, issues affecting their activities and procedures for dealing with unexpected finds including human remains.

11.7 Avoiding Impact to Adjacent Areas

The Cultural Heritage Assessment Report and recommendations made herein are specific to the area assessed for the proposed Stage 5 modifications described in this report and referred to as the 'study area' (refer Figures 1 and 2). All works associated with the Stage 5 modifications should be contained within the study area. Additional archaeological or Aboriginal heritage assessment would be required for any proposed impacts outside the current study area.

Aboriginal objects are known to occur in adjacent landforms and these must be avoided by all proposed extraction activities. Management measures to be implemented should include clear fencing of the boundary of the approved impact zone and the inclusion of Aboriginal heritage in the Environmental Management Plan (EMP). Documented toolbox talks will also be held to ensure all on-site staff and contractors are aware of obligations and requirements regarding the protection of Aboriginal heritage.

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Appendix A Advertisement for registration of interest**General Notices****Notice for Registration of Interest**

Dunmore Sand & Soil Pty Ltd is investigating a modification to the development consent (DA 195-8-2004) of the Dunmore Lakes Sand Project, located at Tabbita Road, Dunmore on the NSW South Coast. The proposed modification is for an additional extraction stage (Stage 5) on adjoining land. The project is located in the Shellharbour Local Government Area. The proponent is Dunmore Sand & Soil Pty Ltd (Rod Wallace, Planning and Development Manager - 38 Tabbita Road, Dunmore NSW 2529).

The proposal has been deemed to be a modification to an existing Part 3A project and is subject to assessment and approval under Section 75W of the Environmental Planning and Assessment Act 1979. Dunmore Sand & Soil Pty Ltd proposes to carry out consultation with Aboriginal people in accordance with the Office of Environment and Heritage Aboriginal cultural heritage consultation requirements for proponents 2010. The purpose of this consultation process is to inform the preparation of environmental assessment documentation and to assist the Department of Planning and Environment in its consideration of any future project applications related to the proposal.

Dunmore Sand & Soil Pty Ltd invites Aboriginal groups and/or Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places at Dunmore NSW to register interest in a process of community consultation with the contact shown below (on behalf of Dunmore Sand & Soil Pty Ltd):

Dunmore Sand & Soil Pty Ltd c/o Kelleher
Nightingale Consulting
Level 10, 25 Bligh Street
Sydney NSW 2000
phone 9232 5373
fax 9223 0680

The closing date for registration is 25 July 2018.

Appeared in: Illawarra Mercury (Wednesday 11 July 2018)

Appendix B Aboriginal community consultation log

RECORD OF ABORIGINAL COMMUNITY CONSULTATION AND CONSULTATION LOG

Aboriginal cultural heritage consultation requirements for proponents 2010 (OEH)

Dunmore Lakes Sand Project – Stage 5 Modifications, Dunmore NSW

Step	Task Requirement	Action	Outcome
4.1.1	Identify if native title exists in relation to the project area.	<p>Conducted National Native TitleVision (NNTV) search on 27/05/2018.</p> <p>Wrote to National Native Title Tribunal (NNTT) for a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements (letter dated 08/06/2018).</p>	<p>NNTV search showed no native title holders and registered Indigenous Land Use Agreements in the project area (27/05/2018).</p> <p>11/06/2018 NNTT: Provided overlap reports for Shellharbour and Kiama LGAs. The study area overlaps one (undetermined) claim by the South Coast People (NC2017/003) Advised no determined native title holders or registered Indigenous Land Use Agreements within these LGAs. South Coast People claimants were invited to register as part of step 4.1.3.</p>
4.1.2	<p>Ascertain, from reasonable sources of information, the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places.</p> <p>Compile a list of Aboriginal people who may have an interest for the proposed project area and hold knowledge relevant to determining the cultural significance of Aboriginal objects and/or places</p>	<p>Wrote to various government agencies to obtain names and contact details of parties that may have an interest or hold cultural knowledge for the project area (letters dated 06/06/2018):</p> <p>Shellharbour City Council (SCC);</p> <p>Illawarra ROG, Office of Environment and Heritage (OEH);</p> <p>Illawarra Local Aboriginal Land Council (DLALC);</p> <p>The Registrar, <i>Aboriginal Land Rights Act 1983</i> for a list of Aboriginal owners (ORALRA);</p> <p>The National Native Title Tribunal (NNTT) for a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;</p> <p>Native Title Services Corporation (NTSCORP Limited); and</p> <p>Wollongong East Local Land Services (LLS), formerly the Catchment Management Authority (CMA).</p> <p>(Letters dated 08/06/2018).</p>	<p>Responses received from:</p> <p>11/06/2018 NNTT: Provided overlap reports for Shellharbour and Kiama LGAs. Advised no determined native title holders or registered Indigenous Land Use Agreements within these LGAs.</p> <p>28/06/2018 OEH: Provided a list of Aboriginal stakeholders known to OEH that may have an interest in the project. Notes that consultation must be carried out before making an application for an AHIP and that consultation does not equal employment. Advises consultants must still advertise for interested parties.</p> <p>16/07/2018 ORALRA: Advised that a search of the Register of Aboriginal Owners returned no results for the project area. Suggested contacting ILALC for further assistance.</p>
4.1.3	<p>Written notification and advertisement:</p> <p>Write to the Aboriginal people whose names were obtained in step 4.1.2 and the relevant LALC(s) to notify</p>	<p>Notification letters (dated 11/07/2018) and invitation to register interest sent to people and groups identified in step 4.1.2, including:</p> <p>Badu</p>	<p>Responses for registration of interest from written notification and advertisement were received from:</p> <p>Barraby Cultural Services (email 13/07/2018)</p>

Step	Task Requirement	Action	Outcome
4.1.3 contd.	<p>them of the proposed project.</p> <p>Place a notice in the local newspaper circulating in the general location of the proposed project, explaining the project and its exact location.</p> <p>Notification by letter and newspaper must include:</p> <p>(a) the name and contact details of the proponent</p> <p>(b) a brief overview of the proposed project that may be the subject of an application for an AHIP, including the location of the proposed project</p> <p>(c) a statement that the purpose of community consultation with Aboriginal people is to assist the proposed applicant in the preparation of an application for an AHIP and to assist the Director-General of OEH in his or her consideration and determination of the application</p> <p>(d) an invitation for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project to register an interest in a process of community consultation with the proposed applicant regarding the proposed activity</p> <p>(e) a closing date for the registration of interests.</p>	<p>Barraby Cultural Services Biamanga Bellambi Indigenous Corporation Gandangara Traditional Owners Bilinga CHTS Bilinga Coomaditchie United Aboriginal Corporation Cullendulla Darryl Caines Dharug Dharug Land Observations Duncan Falk Consultancy Garrara Aboriginal Corporation Gadhu Dreaming Gary Caines Guunamaa Dreamin Sites and Surveying Goobah Gundungurra Tribal Technical Services Gunyu CHTS Gunyu Illawarra Aboriginal Corporation Illawarra LALC James Davis Jerringong Karrial Korewal Elouera Jerrungurah Tribal Elders Council Ken Foster Kullila Site Consultants and Koori Site Management Leanne Tungai La Perouse Botany Bay Corporation Murra Bidgee Mullangari Aboriginal Corporation Minnamunning Munyunga CHTS Munyunga Murramarang Murrumbul CHTS Murrumbul NIAC Norma Simms Nundagurri Pemulwuy Raymond Garbutt South Coast People (Native Title Claimant) South West Rocks Corporation Three Ducks Dreaming Surveying and Consulting Thoorga Nura Tungai Tonghi Wadi Wadi Coomaditchie Aboriginal Corporation Walbunja Warra Bingi Nunda Gurri Wingikara Woronora Plateau Gundangara Elders Council Wullung Wodi Wodi Elders Corporation</p>	<p>Biamanga (email dated 17/07/2018)</p> <p>Cullendulla (email dated 17/07/2018)</p> <p>Duncan Falk Consultancy (20/07/2018)</p> <p>Darug Land Observations (email/letter dated 12/07/2018)</p> <p>Guunamaa Dreamin Sites and Surveying (email dated 12/07/2018)</p> <p>Goobah (email dated 17/07/2018)</p> <p>Gulaga (email dated 17/07/2018)</p> <p>Illawarra LALC (email dated 12/07/2018)</p> <p>James Davis (email dated 27/07/2018)</p> <p>Leanne Tungai (email dated 12/07/2018)</p> <p>Murra Bidgee Mullangari (email dated 13/07/2018)</p> <p>Merrigarn (email dated 13/07/2018)</p> <p>Muragadi HIC (email 13/07/2018)</p> <p>Murramarang (email dated 17/07/2018)</p> <p>Tungai Tonghi (email dated 13/07/2018)</p> <p>Wodi Wodi Coomaditchie Aboriginal Corporation (phone call 26/07/2018)</p> <p>Woronora Plateau Gundangara Elders Council (email dated 13/07/2018)</p> <p>Yurrandaali Cultural Services (email dated 14/07/2018)</p>

Step	Task Requirement	Action	Outcome
4.1.3 contd.		Yurrandaali Cultural Services Yerramurra Advertisement inviting people to register interest in consultation published in the <i>Illawarra Mercury</i> on 11/07/2018. Advertisement attached as Appendix A. Closing date for registration of interest was 25/07/2018.	
4.1.4	A minimum of 14 days from the date the letter was sent or notice published in the newspaper to register an interest.	Closing date for registration of interest included in the notification letters and notice in the newspaper was at least 14 days from the date the letters were sent and notice appeared in the newspaper. Closing date for registration of interest was 25/07/2018.	Copy of newspaper advertisement attached.
4.1.5	Must advise Aboriginal people who are registering an interest that their details will be forwarded to OEH and the LALC unless they specify that they do not want their details released.	Groups informed by letters (dated 11/07/2018) or verbally over the phone if they registered by phone.	No Aboriginal stakeholder groups specified that they did not want their details to be released.
4.1.6	Make a record of the names of each Aboriginal person who registered an interest. Provide a copy of that record and copy of the notification from step 4.1.3 to the relevant OEH EPRG regional office and LALC	List of registered stakeholders compiled. No registered Aboriginal stakeholder groups specified that they did not want their details to be released.	Letters sent to OEH and Illawarra LALC with list of registered Aboriginal stakeholders (letters dated 31/07/2018). No registered Aboriginal stakeholder groups specified that they did not want their details to be released.
4.1.7	LALCs holding cultural knowledge relevant to determining the significance of Aboriginal objects and places in the proposed project area who wish to register an interest to be involved in consultation must register their interest as an Aboriginal organisation rather than individuals.	Illawarra LALC registered interest to be involved in consultation.	Illawarra LALC registered interest as an organisation. Provided contact details for the LALC and the name of a LALC representative to act as contact person (Paul Knight).

Step	Task Requirement	Action	Outcome
4.1.8	<p>Where an Aboriginal organisation representing Aboriginal people who hold cultural knowledge has registered an interest, a contact person for that organisation must be nominated.</p> <p>Aboriginal cultural knowledge holders who have registered an interest may indicate they have appointed a representative to act on their behalf. Where this occurs, the registered Aboriginal party must provide written confirmation and contact details of those individuals to act on their behalf.</p>	<p>Responses received from organisations and individuals registering interest in the project.</p> <p>Contact details and names of representatives were also provided.</p>	<p>Aboriginal stakeholders have registered as an organisation name or as individuals.</p> <p>Contact details and names of representatives for the organisations were also provided and confirmed during the registration of interest process.</p>
4.2	Presentation of information about the proposed project	<p>Information regarding the proposed project provided throughout the consultation process including letters sent on 11/07/2018 and 20/08/2018.</p> <p>Informal discussions also held during the registration of interest period.</p>	No responses to the provision of project information.
4.3.1-4.3.2	Notification of proposed assessment methodology	<p>Copy of the proposed assessment methodology sent to all registered stakeholders with an invitation to provide comment (letters dated 20/08/2018).</p> <p>A 28 day review period was provided.</p>	<p>Responses to the proposed assessment methodology were received from Barraby Cultural Services (BCS), Duncan Falk Consultancy (DFC), Murra Bidgee Mullangari Aboriginal Corporation (MBMAC), Muragadi Heritage Indigenous Corporation (Muragadi), Tungai Tonghi, Woronora Plateau Gundangara Elders Council (WPGEC), and Yurrandaali Cultural Services (Yurrandaali).</p> <p>BCS stated that they supported the proposed assessment methodology for the project (email dated 22/08/2018).</p> <p>DFC stated they had read and reviewed the methodology and endorsed the proposed approach (email/letter dated 28/08/2018).</p> <p>MBMAC expressed support for the recommendations in the assessment methodology (email dated 21/08/2018).</p> <p>Muragadi stated they had reviewed the project information and proposed methodology and endorsed the proposed approach (email dated 21/08/2018).</p>

Step	Task Requirement	Action	Outcome
4.3.1- 4.3.2			<p>Tungai Tonghi affirmed their interest in the project (email dated 23/08/2018).</p> <p>WPGEC advised they had received the methodology (email dated 20/08/2018) and asked for further detail regarding the test excavation program (specific number of test pits and size of the test areas). Dr Matthew Kelleher (KNC) responded via phone call on 27/08/2018 to confirm the location of test areas and identified sensitive landforms, and discuss the amount of test squares estimated to be required to sample these. WPGEC agreed with the proposed approach.</p> <p>Yurrandaali stated that they supported the proposed methodology (22/08/2018).</p>
4.3.3	Gathering information about cultural significance	Aboriginal stakeholders invited to provide information about cultural significance the area (letters dated 11/07/2018, 20/08/2018 and 25/01/2019). Previous comments recognised and additional comments sought.	<p>Throughout the assessment process, cultural knowledge regarding the Aboriginal cultural/social values of the study area and identified archaeological sites was sought from registered stakeholders.</p> <p>Identified Aboriginal cultural values of the study area are discussed in section 2.6 of the CHAR.</p>
4.4	Review of draft cultural heritage assessment report	<p>Stakeholders were provided with a copy of the draft CHAR and invited to review and provide comments/feedback (review package sent 25/01/2019).</p> <p>A 30 day review period was provided, ending on 25/02/2019 – review period extended in consideration of Christmas holiday period</p>	<p>Responses to the draft CHAR were received from Barraby Cultural Services (BCS), Duncan Falk Consulting (DFC), Guunamaa Dreamin Sites and Surveying (GDSS), Leanne Tungai, Murra Bidgee Mullangari Aboriginal Corporation (MBMAC), Muragadi Heritage Indigenous Corporation (Muragadi), Merrigarn Indigenous Corporation (Merrigarn), Yurrandaali Cultural Services (Yurrandaali) and Woronora Plateau Gundangara Elders Council (WPGEC).</p> <p>BCS acknowledged receipt of the draft CHAR but did not provide any further comment (email dated 28/01/2019).</p> <p>DFC stated they had reviewed the draft CHAR and agreed with the proposed salvage. DFC also noted they supported the proposed two-stage salvage approach, in order to identify the best locations for open area salvage (email dated 26/01/2019).</p> <p>GDSS acknowledged receipt of the draft CHAR and expressed their interest in being involved in the proposed salvage excavation fieldwork at the sites (email dated 25/01/2019).</p>

Step	Task Requirement	Action	Outcome
4.4 contd.			<p>Leanne Tungai acknowledged receipt of the draft CHAR and stated that she would like to be involved in future work on this project (email dated 26/01/2019). No further comment was provided during the review period.</p> <p>MBMAC stated they had read the draft CHAR and agreed with the recommendations (email dated 25/01/2019).</p> <p>Muragadi stated they agreed with the recommendations made by KNC (email dated 25/01/2019).</p> <p>Merrigarn also stated they had reviewed the draft CHAR and agreed with the recommendations (email dated 25/01/2019).</p> <p>Yurrandaali acknowledged receipt of the draft CHAR but did not provide any further comment (email dated 28/01/2019).</p> <p>WPGEC reconfirmed the identified archaeological value of the project area; however expressed opposition to the proposed development on several grounds (email/letter dated 25/02/2019). A response is provided in Section 2.5 of the CHAR.</p>

Appendix C Aboriginal stakeholder comments on draft CHAR

Cristany Milicich

From: lee field <barrabyculturalservices@gmail.com>
Sent: Monday, 28 January 2019 11:37 AM
To: Cristany Milicich
Subject: Re: 1745 Dunmore Lakes Sand draft CHAR review - BCS

Categories: Purple Category

Received, Thankyou.

Regards
Lee Field

On Fri, Jan 25, 2019 at 4:31 PM Cristany Milicich <cristany.milicich@knconsult.com.au> wrote:

Dear registered Aboriginal stakeholder,

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter.

The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich

Project Archaeologist

Kelleher Nightingale Consulting Pty Ltd

Level 10, 25 Bligh St

Sydney NSW 2000

p 02 9232 5373

Cristany Milicich

From: Duncan Falk <DuncanFalk@hotmail.com>
Sent: Saturday, 26 January 2019 3:31 PM
To: Cristany Milicich
Subject: Re: 1745 Dunmore Lakes Sand draft CHAR review - DFC

Categories: Purple Category

Hey Cristany,

Happy New Year to you too and I had a great time off thanks for asking.

I have read through the draft and can see from the test excavation results that a salvage is needed and that proceeding to complete it in two stages would be the best method to identify the area and then continue to the large area salvage. I didn't find any discrepancies within the document provided.

With thanks,

Duncan

From: Cristany Milicich <cristany.milicich@knconsult.com.au>
Sent: Friday, 25 January 2019 4:35 PM
To: Duncan Falk
Subject: 1745 Dunmore Lakes Sand draft CHAR review - DFC

Hi Duncan,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter. The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich
Project Archaeologist
Kelleher Nightingale Consulting Pty Ltd
Level 10, 25 Bligh St
Sydney NSW 2000
p 02 9232 5373

Cristany Milicich

From: Richard Campbell <richardcampbell123@outlook.com>
Sent: Friday, 25 January 2019 5:47 PM
To: Cristany Milicich
Subject: Re: 1745 Dunmore Lakes Sand draft CHAR review - GDSS
Categories: Purple Category

Hi thanks for email but can my group be involved with the salvage this time as i missed out on the work bfor.

Kind regards

Richard

On 25 Jan. 2019 4:37 pm, Cristany Milicich <cristany.milicich@knconsult.com.au> wrote:

Hi Richard,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter.

The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich

Project Archaeologist

Cristany Milicich

From: Leanne Tungai <leannecaroltungai@gmail.com>
Sent: Saturday, 26 January 2019 1:02 AM
To: Cristany Milicich
Subject: Re: 1745 Dunmore Lakes Sand draft CHAR review - Leanne Tungai

Categories: Purple Category

Thanks, I'll take a look.
And would like to be involved in future work on this project please

On Fri, 25 Jan 2019 at 4:43 pm, Cristany Milicich <cristany.milicich@knconsult.com.au> wrote:

Hi Leanne,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter.

The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich

Project Archaeologist

Kelleher Nightingale Consulting Pty Ltd

Level 10, 25 Bligh St

1

Cristany Milicich

From: Ryan Johnson <murrabidgeemullangari@yahoo.com.au>
Sent: Friday, 25 January 2019 7:25 PM
To: Cristany Milicich
Subject: RE: 1745 Dunmore Lakes Sand draft CHAR review - MBMAC

Categories: Purple Category

Hi Cristany,

I have read the project information and draft CHAR for the above project, I endorse the recommendations made by Kelleher Nightingale. If you require further details please contact me via mobile 0475565517.

Thanks

Ryan Johnson | **Murra Bidgee Mullangari**



Aboriginal Corporation Cultural Heritage

A: PO Box 246, Seven Hills, NSW, 2147
E: murrabidgeemullangari@yahoo.com.au
ICN: B112

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From: Cristany Milicich [<mailto:cristany.milicich@knconsult.com.au>]
Sent: Friday, 25 January 2019 4:43 PM
To: Ryan Johnson <murrabidgeemullangari@yahoo.com.au>
Subject: 1745 Dunmore Lakes Sand draft CHAR review - MBMAC

Hi Ryan,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter. The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Millich
Project Archaeologist
Kelleher Nightingale Consulting Pty Ltd
Level 10, 25 Bligh St
Sydney NSW 2000
p 02 9232 5373

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Cristany Milicich

From: Shaun Carroll <Merrigarn@hotmail.com>
Sent: Friday, 25 January 2019 7:54 PM
To: Cristany Milicich
Subject: RE: 1745 Dunmore Lakes Sand draft CHAR review - MIC

Categories: Purple Category

Hi Cristany,
I have read the Draft CHAR review, I endorse the recommendations made by Kelleher Nightingale for the above project.
Kind regards
Shaun Carroll

From: Cristany Milicich [<mailto:cristany.milicich@knconsult.com.au>]
Sent: Friday, 25 January 2019 4:45 PM
To: merrigarn@hotmail.com
Subject: 1745 Dunmore Lakes Sand draft CHAR review - MIC

Hi Shaun,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.
Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter. The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich
Project Archaeologist
Kelleher Nightingale Consulting Pty Ltd
Level 10, 25 Bligh St
Sydney NSW 2000
p 02 9232 5373

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Cristany Milicich

From: Muragadi <muragadi@yahoo.com.au>
Sent: Friday, 25 January 2019 7:59 PM
To: Cristany Milicich
Subject: RE: 1745 Dunmore Lakes Sand draft CHAR review - MHIC

Categories: Purple Category

Hi Cristany,
I have read the project information, draft CHAR report for 1745 Dunmore Lakes Sand and agree with the recommendations made by Kelleher Nightingale Consulting.
Kind regards
Anthony

From: Cristany Milicich [<mailto:cristany.milicich@knconsult.com.au>]
Sent: Friday, 25 January 2019 4:44 PM
To: jesse johnson <muragadi@yahoo.com.au>
Subject: 1745 Dunmore Lakes Sand draft CHAR review - MHIC

Hi Jesse,

Happy New Year and I hope you had a good break.

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.
Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter.
The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich
Project Archaeologist
Kelleher Nightingale Consulting Pty Ltd
Level 10, 25 Bligh St
Sydney NSW 2000
p 02 9232 5373

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DUNMORE LAKES SAND PROJECT – STAGE 5 MODIFICATIONS – DUNMORE - NSW

Woronora Plateau Gundangara Elders Council (WPGEC) do not support the proposed modifications of extraction of DLS Boral AFT 1 & DLS Boral AFT 2. The proposed modifications & extraction will see the mine's life extended for a further three to four years, causing irreparable and complete destruction of a rare and valuable natural and cultural landscape. Dunmore Lakes is one of very few undisturbed estuarine environments remaining in the Illawarra region and wider surrounds, holds an intact and rich archaeological site, and encompasses land of cultural and modern historical importance. The identified high significance of harm to the impacted area must be considered to be of more worth than the profits to be made from the proposed destructive activities by Boral (insert the full name of company or whoever is responsible here). Mitigation, in this case of direct and total loss of value of this site, would be an inadequate solution and it is preferred that the aforementioned modifications and further mining activities cease completely.

WPGEC along with other key stakeholder groups and the local Aboriginal community are of the strong belief that this site is significant for several reasons:

1. Its value as a rare undisturbed estuary environment in the Illawarra region.
2. The intactness of its archaeological deposits and its cultural importance as a site of continuous occupation with evidence of a lengthy and maintained connection to this land. This has been established through previous archaeological investigations, the most recent and relevant to this specific study area being the test excavations of 5A and 5B completed by Kelleher Nightingale Consulting and registered stakeholder groups between the 19th and 23rd November 2018. A total of 461 artefacts found at site DLS Boral AFT 1 and 828 artefacts found at site DLS Boral AFT 2. These artefacts included coarse silcrete flaked fragments with cortex, crystalline quartz backed artefacts, retouched jasper and silcrete, a petrified wood backed blade, an agate geometric microlith, a charcoal feature, and a hammerstone which was recorded *in situ* at around 65cm depth and a sandstone ground stone. The number and distribution of artefacts clearly show that occupation and activities at this site occurred during a prolonged period of time, and on a repeated basis. Furthermore, analysis and interpretation of the material recovered from these test excavations may suffice for the purposes of understanding and managing sites in similar estuarine environments, thus not requiring the data from the proposed salvage and allowing this site to remain otherwise intact.
3. Its proximity to the site of a massacre which occurred just to the south of the study area.

"In October 1818 Lieutenant Weston, land owner at Dapto and Cornelius O'Brien, formerly a stockman at Sandon Point and now the overseer of a property at Yallah, organised a group of seven labourers and convicts. Unusually armed with muskets, cutlasses and pikes, they headed to Kiama supposedly to fetch two muskets lent to a group of people living on the Minnamurra River. According to Young Bundle, who was long trusted by the British, the posse killed all the people at the camp. The attackers admitted only to wounding a boy in self-defence. After a sharp letter of protest from Charles Throsby to Governor Macquarie, the murders were investigated by D'Arcy Wentworth, the Principal Superintendent of Police, along with other magistrates. They took no action against the killers despite a letter from Governor Macquarie to D'Arcy Wentworth expressing his "surprise, regret and displeasure" at their findings".
(Donaldson et al 2017:13).

This atrocity has now been formally acknowledged by Kiama Council, an action which should prompt appropriate respect for the site and its surrounds.

4. Its high potential of containing burials due to the traditional practices in the Illawarra region of digging graves in the soft soil along waterways, including the Minnamurra River, or into sand banks. Additionally, the proximity to the massacre noted in (3) may provide further weight to the possibility of burials. Observations by early European settlers of similar mass deaths in the region detail how the dead would be buried nearby and close to water. Lynch (1820), for example, recounts how around seventy men, killed in the battle of Fairy Meadow, were buried in the scrub between the battle ground and the sea, between the two arms of Fairy Creek. There is therefore reason to suspect, due to the natural landscape of the Dunmore Lakes area, its recent history, and comparable information, that there may be burials from both the distant and more recent past.

The Aboriginal people of Australia possess one of the oldest continuous living cultures in the world. The protection of cultural and spiritual landscapes and materials, including sacred sites and artefacts, both past and present, is vital to maintaining this culture. We believe any type of mining of the land is unacceptable, especially for the financial gain of a highly profitable company that has already destroyed other parts of the land and impacted the local communities and environment to date. The Australian Government has legislation in place such as the Heritage Act, 1977 and the Environmental Planning and Assessment Act 1979, which acts to protect heritage listed items as they represent Australian and European culture and history, and this is seen being enforced around Australia on a daily basis. Aboriginal culture and history demands the same respect and value, through the regular and repeated preservation and protection of significant sites such as Dunmore Lakes.

WE OPPOSE ANY APPROVAL FOR THE MINING OF SAND FOR THIS PROJECT.



Kind Regards
Kayla Williamson
Woronora Plateau Gundangara Elders Council

REFERENCES

Donaldson, M., L. Bursill, & M. Jacobs, 2017. A History of Aboriginal Illawarra, Volume 2: Colonisation, Dharawal Publications: Yowie Bay, NSW.

<https://www.environment.nsw.gov.au/resources/cultureheritage/illawarraAboriginalHistory.pdf>

Kelleher Nightingale Consulting Pty Ltd (KNC) 2019. Dunmore Lakes Sand Project – Stage 5 Modifications, DUNMORE: CHAR.

We have supporting signatures below of stakeholder groups and community members that also have the same view as listed above.

NAME	GROUP/COMMUNITY	SIGNATURE
L. Brown	Pennington Aboriginal Corp	Lorraine Brown
N THOMAS	COOMADITCHIE Aboriginal	Neville Thomas
J brown	Dunbartonshire	Jbrown
A Day	COOMADITCHIE Aboriginal	A Day
W. Archibald	COOMADITCHIE	W Archibald
R. Dutton	Goobah	R. Dutton
Kim Davis	WODI-WODI	Kim Davis
BROOKE DAVIS	WODI-WODI	Brooke Davis
Julie Lulard	Noogaleek	Julie Lulard
Bronwyn	Noogaleek - Yuin	Bronwyn
Tama Moran	Noogaleek - Yuin	Tama Moran
Teresa Day	Noogaleek	Teresa Day
Manda Schembi	Noogaleek	Manda Schembi
Shay Price	Noogaleek	Shay Price
Mackellayana	Noogaleek	M.S. Mackellayana
Roslynne Webb	Yuin	Roslynne Webb

NAME	GROUP/COMMUNITY	SIGNATURE
Mark Petruszewski	ELOURA, ELGER	Mark Petruszewski

NAME	GROUP/COMMUNITY	SIGNATURE
Leanne Tungee	Leanne Tungee (Waganyi)	<i>[Signature]</i>
Steve Henry	community member Shdney	<i>[Signature]</i>
Kevin Booth	Community Member	<i>[Signature]</i>
James DAVIS	Wodi Wodi	<i>[Signature]</i>
Clint Davis	Wodi: wodi	<i>[Signature]</i>
Bryan Tebbutt	Wodi wodi	<i>[Signature]</i>
Megan Dalmaro	wodi wodi	<i>[Signature]</i>
Paul Cummins	Elouera Tribal Elder	<i>[Signature]</i>
TROY TONSOI	TUNSOI / TONSOI	<i>[Signature]</i>
KRISTY THOMAS	COOMADITICIE	<i>[Signature]</i>
Sandra Campbell	THOOGA NURA	<i>[Signature]</i>
PAUL KNIGHT	COMMUNITY MEMBER	<i>[Signature]</i>
Renai Smith	(IAC) Wiradyri	<i>[Signature]</i>
Irene Hood	(IAC) Yunin	<i>[Signature]</i>
Deke Thelth	(IAC) Yun	<i>[Signature]</i>
E Henna	KANGAROO DC	
William Henry	CEO IAC	<i>[Signature]</i>
RICHARD DAVIS	CHAIRPERSON IAC	<i>[Signature]</i>

Cristany Milicich

From: Bo Field <yurraandaali_cs@hotmail.com>
Sent: Monday, 28 January 2019 11:40 AM
To: Cristany Milicich
Subject: Re: 1745 Dunmore Lakes Sand draft CHAR review - YCS

Categories: Purple Category

Recieved,

Thankyou
Bo Field

Sent from [Outlook](#)

From: Cristany Milicich <cristany.milicich@knconsult.com.au>
Sent: Friday, 25 January 2019 4:48 PM
To: Yurraandaali_cs@hotmail.com
Subject: 1745 Dunmore Lakes Sand draft CHAR review - YCS

Dear registered Aboriginal stakeholder,

We have completed the draft CHAR report for the proposed Stage 5 modification at the Dunmore Lakes Sand quarry.

Thank you for your comments and involvement in the project to date. Please find attached a cover letter and a copy of the draft report for your review.

We are recommending salvage excavation for two sites within the area.

If you have any comments please send these through to myself or Zac using the details in the attached cover letter. Also please let me know if you would like a hard copy. The review period closes on **Monday 25 February 2019**.

Thanks and regards,

Cristany Milicich
Project Archaeologist
Kelleher Nightingale Consulting Pty Ltd
Level 10, 25 Bligh St
Sydney NSW 2000
p 02 9232 5373

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March 1, 2019

Cristany Millich
 Project Archaeologist
 Kelleher Nightingale Consulting Pty Ltd
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DUNMORE LAKES SAND PROJECT – STAGE 5 MODIFICATIONS DUNMORE, NSW

Aboriginal Cultural Heritage Assessment Report Response

The Illawarra Local Aboriginal Land Council has reviewed the report in relation to the proposed Dunmore Lakes Sand Project – Stage 5. We would like to record our objection to this development proceeding due to the significant cultural and environmental damage that would occur. We would also like to draw attention to the fact that the Aboriginal community, and I am sure the wider community generally does not believe that the destruction of this area through the expansion of the sanding mining facility is in keeping with the expectations and values we hold for this area. Furthermore, we would contest that the economic impact which may be attributed to this project and its State Significant Status does not align with the cost that will be borne by the community in the future. It is our recommendation that this development does not proceed and that all extractive industries are restricted from further development in this environmentally and culturally significant location.

To support our position on this matter we would like to draw attention to the findings in the report which we believe support our recommendation. We also note that the objectives of this report were to assess impacts of the proposed expansion activities and develop appropriate mitigation measures. In this instance we do not support any mitigation measures as the area concerned is considered to be of very high cultural significance to the local community.

Firstly we note that three (3) Aboriginal archaeological sites were identified in the proposed pit expansion area: DLS Boral AFT 1, DLS Boral AFT 2 and DLS Boral AFT 3. All three sites would be impacted by the proposed works as identified in the report.

1.1 Aboriginal cultural values

The report acknowledges that the archaeological significance of the identified Aboriginal sites was determined by their research value, representativeness, intactness and rarity and that on the basis of these criteria, sites DLS Boral AFT 1 and DLS Boral AFT 2 display moderate-high archaeological significance and site DLS Boral AFT 3 displays low archaeological significance. While we agree with the high significance finding identified, we contest the reasoning and the process used for this rating. We assert the fact that Aboriginal people and our cultural history should not have its importance ranked by its research value, combined with structures that have been determined by a values position of non-Aboriginal people. Furthermore, we recognise that this landscape and area holds significance that can't be constrained to scientific value. The destruction of this area will eliminate, without the potential for repair, a significant cultural and environmental landscape which has already seen the destructive hand of western values. We therefore demand that this continued destruction and undervaluing of Aboriginal history stop and that we rightfully be respected as the custodians of this land, as you cannot return what you continue to destroy.

The Illawarra Local Aboriginal Land Council's view and our position on this development is further supported through the recorded consultation with the 19 registered Aboriginal stakeholders in the report. These stakeholders identified that the study area has cultural heritage value to the local Aboriginal community. In particular, Aboriginal stakeholders expressed the cultural importance and significance of the landscape around the study area. The Land Council would contest and challenge that the actual comments by these stakeholders would have been presented in a stronger voice and elevated that significance of the area, which would have not just indicated that the area has cultural heritage value, but high cultural heritage value and that the area had high cultural importance which included the overall landscape associated to the area.

The report recommends that the mitigation program should comprise of an archaeological salvage, undertaken prior to the commencement of the proposed works, where portions of significant Aboriginal sites would be impacted by the proposal. The Land Council and the Aboriginal community identifies the entire precinct as being significant and as one cultural site. This is due to the connectedness of the landscape features and to destroy any aspect of this landscape would destroy the entire site in our view. The report identifies significant Aboriginal sites as exhibiting at least moderate archaeological value and that two sites within the study area require salvage excavation: DLS Boral AFT 1 and DLS Boral AFT 2. Again, it is the view of the Aboriginal Land Council that this under represents the significance of this site and the potential destruction of a highly valued and culturally significant area.

The report identifies the significance of the DLS Boral AFT 1 and DLS Boral AFT 2 archaeological resource as residing in the information it contains, its intactness and rarity in the local region. It further highlights that sites DLS Boral AFT 1 and DLS Boral AFT 2 contain a large number and diverse range of cultural material, have largely intact stratified deposits, and are in fair to good condition with some surface disturbance. The rarity of the archaeological landscape and selective nature of the identified Aboriginal objects means that recovery of the sites' information will offer substantial scientific and cultural knowledge. In this regard, salvage excavation of DLS



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Boral AFT 1 and DLS Boral AFT 2 is a suitable heritage outcome for the archaeological sites as it will retrieve and curate a representative sample of the information exhibited by the archaeological sites. The Land Council agrees with the value of these areas, however we do not support the salvage of items in this location. The significance of this site to the Aboriginal community is because it is intact and we would like it kept in this way. The likelihood of any activity uncovering even more significant cultural material is high and we would like our values respected as per the Burra Charter.

DLS Boral AFT 1	AHIMS tbc	Moderate-High significance	Total Impact	Salvage excavation to mitigate impact
DLS Boral AFT 2	AHIMS tbc	Moderate-High significance	Total Impact	Salvage excavation to mitigate impact
DLS Boral AFT 3	AHIMS tbc	Low significance	Total Impact	No mitigation required

1.2 Heritage register searches

The Land Council acknowledges that a search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area.

The AHIMS search results revealed 29 Aboriginal sites had been recorded within the search area (Figure 5). No Aboriginal places had been declared within the search area and that the Site features ('site types') were listed as per the table below.

Table 2. Registered Aboriginal sites around the study area (AHIMS results)

Site Context	Site Features (Site Type)	Total	%
Open	Artefact	9	31.1
	Shell; Artefact (Midden)	18	62.1
	Shell	1	3.4
	Restricted Site*	1	3.4
Total		29	100

*Discussions were held with the AHIMS registrar regarding the location of the restricted site. It was confirmed that this site is not located within the vicinity of the study area (David Gordon, personal communication, 18/12/2018).

1.1 Previous investigations around the study area

The Land Council would like to highlight and reassert that the AHIMS system only identifies known sites and that during the investigation that contributed to this report, a greater understanding of the occupation of this area was achieved, although the investigations were appropriately limited. Furthermore, that any consideration for development in this area needs to recognise that the whole landscape associated with floodplains along the Minnamurra River are likely to hold high levels of cultural significance to the local Aboriginal community. This is reflected in the numerous previous reports that have been conducted in associated landscapes that are in and around this river system and identified in the report which highlights that overall, previously recorded Aboriginal archaeological sites around the study area demonstrate a variety of site types and geographical locations.

The report proceeds to acknowledge that AHIMS results and background research indicate that a relationship exists between the site type and environmental context, demonstrating the different ways in which Aboriginal people used the landscape and the subsequent archaeological record of these activities. The general assumptions that stem from the results of previous assessments in the estuarine environments point out that various sedimentation processes associated with the infilling of the estuary and the aggrading nature of lower slopes may have resulted in covering of the archaeological sites.

The report highlights the need for test excavations which would most likely determine whether the subsurface archaeological deposit is present. The most likely Aboriginal site types to occur within the study area and its surroundings are artefact scatters often associated with shell middens. They are likely to occur on the well-drained, remnant landforms bordering the estuary resource zones. They often might be exposed by land use practices, such as mining activities and removal of trees, or geomorphological processes, such as erosion and fluvial activity.

As the proposed project area reflects the highlighted landscape it is highly likely that more artefacts will be present. Additionally, in the view of the Aboriginal Land Council, the need for further destructive investigative work is obsolete. No further investigation is needed in this area as the combination of all the previous reports and the investigations during the development of this report continually display that Aboriginal occupation in this area is in keeping with views and cultural histories that have been provided by the local Aboriginal community. We see no need to undertake destruction of our heritage to fulfil what in this instance could prove to be the morbid curiosity of uncovering a burial site or simply because someone or group would like to further understand the Aboriginal occupation of this area. It should simply be enough that Aboriginal people are stating that we occupied this area, it's important to us and that it should be left as is, particularly when we have a significant number of previous investigations which also support this position.



Illawarra Local Aboriginal Land Council

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7 Management and recommendations

The Illawarra Local Aboriginal Land Council strongly objects to the management and mitigation measures as identified in the report and recommend a complete cease to pursuing this development further.

Our position of ceasing all prospect of this development proceeding is directly supported by at least 4 articles in the Burra Charter. The Charter can be applied to all types of places of cultural significance including natural, Indigenous and historic places with cultural values and is a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians.



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We therefore highlight several articles in this charter which we believe this develop and the recommendation for salvage ignores in this report. These are:

Article 3. Cautious approach

3.1 *Conservation* is based on a respect for the existing *fabric, use, associations and meanings*. It requires a cautious approach of changing as much as necessary but as little as possible.

Changes to a *place* should not distort the physical or other evidence it provides, nor be based on conjecture.

5.1 *Conservation* of a *place* should identify and take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others.

This development in no way acknowledges these responsibilities on the development of areas with heritage significance.

Article 7. Use

7.1 Where the *use* of a *place* is of *cultural significance* it should be retained.

A *place* should have a *compatible use*. The policy should identify a use or combination of uses or constraints on uses that retain the cultural significance of the place. New use of a place should involve minimal change to significant fabric and use; should respect associations and meanings; and where appropriate should provide for continuation of activities and practices which contribute to the cultural significance of the place.

This project will result in permanent and unrepairable damage and therefore should not proceed

Article 8. Setting

Conservation requires the retention of an appropriate *setting*. This includes retention of the visual and sensory setting, as well as the retention of spiritual and other cultural relationships that contribute to the *cultural significance* of the *place*.

New construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate.

Again, this development is not in keeping with the aspect of the Burra Charter.

Article 15. Change

15.1 Change may be necessary to retain *cultural significance*, but is undesirable where it reduces cultural significance. The amount of change to a place and its use should be guided by the cultural significance of the place and its appropriate interpretation.

15.2 Changes which reduce cultural significance should be reversible, and be reversed when circumstances permit.

15.3 Demolition of significant fabric of a place is generally not acceptable. However, in some cases minor demolition may be appropriate as part of *conservation*. Removed significant fabric should be reinstated when circumstances permit.

15.4 The contributions of all aspects of cultural significance of a place should be respected. If a place includes *fabric, uses, associations or meanings* of different periods, or different aspects of cultural significance, emphasising or interpreting one period or aspect at the expense of another can only be justified when what is left out, removed or diminished is of slight cultural significance and that which is emphasised or interpreted is of much greater cultural significance.

The whole proposal and the recommendations of this report to place any consequence or importance to the irreparable damage to Aboriginal heritage and the values relating to place and therefore this project and the recommended salvage should not proceed

It is the recommendation of the Illawarra Local Aboriginal Land Council that this project is topped and that no further work is undertaken in relation to the Dunmore Lakes Sand Project.

Regards

Paul Knight
Chief Executive Officer

Appendix D Extensive AHIMS search results

Office of
Environment
& HeritageAHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : 1745

Client Service ID : 386985

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
52-5-0159	Tabbagong;Tabbagong 1; Contact	AGD	56	301865	6165336	Open site	Valid	Shell :-, Artefact :-	Midden	
	Recorders			Kilm Gollan				Permits		
52-5-0160	Minnamurra; Contact	AGD	56	301143	6164865	Open site	Valid	Shell :-, Artefact :-	Midden	1473,99329
	Recorders			ASRSYS				Permits		
52-5-0162	Minnamurra River;Gainsborough Estate; Contact	AGD	56	302350	6164600	Open site	Valid	Shell :-, Artefact :-	Midden	99329
	Recorders			Rod Wellington				Permits		
52-5-0167	Minnamurra;Minnamurra Spit 2; Contact	AGD	56	303260	6166700	Open site	Valid	Shell :-, Artefact :-	Midden	
	Recorders			Rod Wellington				Permits		
52-5-0168	Minamurra;Minamurra Spit 1; Contact	AGD	56	303490	6166280	Open site	Valid	Shell :-, Artefact :-	Midden	
	Recorders			ASRSYS				Permits		
52-5-0169	Minamurra; Bass Point SRA; Contact	AGD	56	302750	6167400	Open site	Valid	Shell :-, Artefact :-	Midden	102212
	Recorders			Miss:Marjorie Sullivan				Permits		
52-5-0251	Dunmore 1 Contact	AGD	56	301540	6166460	Open site	Valid	Artefact :-	Open Camp Site	687,1662,2048
	Recorders			Kerry Navin,Mr.Kelvin Officer				Permits		
52-5-0252	Dunmore 2; Contact	AGD	56	301360	6166600	Open site	Valid	Artefact :-	Open Camp Site	1662
	Recorders			Kerry Navin,Mr.Kelvin Officer				Permits		
52-5-0253	Dunmore 3 Contact	AGD	56	301830	6166930	Open site	Valid	Artefact :-	Open Camp Site	687,1662,2048
	Recorders			Kerry Navin,Mr.Kelvin Officer				Permits		
52-5-0254	Dunmore 4; Contact	AGD	56	301480	6167260	Open site	Valid	Artefact :-	Open Camp Site	1662
	Recorders			Kerry Navin,Mr.Kelvin Officer				Permits	1519	
52-5-0255	Dunmore 5; Contact	AGD	56	301400	6167110	Open site	Valid	Artefact :-	Open Camp Site	1662
	Recorders			Kerry Navin,Mr.Kelvin Officer				Permits	1519	
52-5-0112	Minnamurra; Contact	AGD	56	302052	6165157	Open site	Valid	Shell :-, Artefact :-	Midden	2048
	Recorders			Kate Sullivan				Permits		
52-5-0116	Dunmore; Killalea; Contact	AGD	56	303652	6167475	Open site	Valid	Shell :-, Artefact :-	Midden	
	Recorders			Kate Sullivan				Permits		
52-5-0117	Minnamurra; Contact	AGD	56	301856	6165793	Open site	Valid	Artefact :-	Open Camp Site	
	Recorders			Kate Sullivan				Permits		
52-5-0118	Dunmore; Contact	AGD	56	304265	6168860	Open site	Valid	Artefact :-	Open Camp Site	102212
	Recorders			A Henderson				Permits		
52-5-0199	Killalea Beach;S.R.A.;Albion Park; Contact	AGD	56	304150	6168000	Open site	Valid	Shell :-, Artefact :-	Midden	102212
	Recorders			A Anderson				Permits		
52-5-0201	Dunmore Midden Shellharbour Waste Disposal Dump Contact	AGD	56	302000	6167800	Open site	Valid	Artefact :-	Open Camp Site	901
	Recorders			Ms.Laila Haglund,Bonhomme Craib & Associates				Permits		

Report generated by AHIMS Web Service on 04/12/2018 for Kristen Taylor for the following area at Datum :GDA, Zone : 56, Eastings : 300800 - 304650, Northings : 6164300 - 6169300 with a Buffer of 200 meters. Additional Info : to help with determining archaeological potential. Number of Aboriginal sites and Aboriginal objects found is 29

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Appendix E Salvage Excavation Methodology

Methodology

Research Aims

The main aims of the proposed salvage excavation program are:

- ◆ To salvage a representative sample of the identified archaeological sites prior to development impact.
- ◆ To analyse the salvaged archaeological material to gain and conserve knowledge and understanding of the scientific and cultural information exhibited by the activities associated with coastal landforms.

The further scientific aim of the salvage excavation program would be to determine the subsurface integrity, extent, spatial distribution and nature of the cultural deposit and the specific types of associated archaeological/cultural activities.

- ◆ Determining the integrity of the deposit involves assessing the degree of disturbance which is present.
- ◆ Determining the statistical extent of the sites and/or activity areas involves identifying the boundaries associated with the identified archaeological deposit.
- ◆ Assessing the spatial distribution involves identifying the presence/absence of archaeological material across the identified archaeological sites.
- ◆ The nature of the sites refers to the type of activities indicated by the artefactual material (e.g. primary production, domestic knapping, hunting camps). The goal would be to retrieve entire assemblages from specific activities if such activities were present.
- ◆ Retrieved assemblages would be compared with the results from other relevant archaeological projects in order to assess significance.

Research Questions

Archaeologically, sites DLS Boral AFT 1 and 2 represent important resource enabled (from estuary environments) focal points. Such focal points are often associated with very selective activity, which is reinforced by the selective and high quality nature of the artefacts recovered during the test program. The results of the proposed salvage excavation would increase our understanding of subsurface archaeology within the study area. In particular, research would focus on the archaeologically-identifiable cultural activities that took place within the beach sand bodies adjacent to the Minnamurra River estuary. DLS Boral AFT 1 and DLS Boral AFT 2 represent site types uncommon due to their low levels of previous disturbance in the region and the close association with an estuary may have facilitated longer, repeated or more specialised use of this area.

What can we expect?

It is anticipated that differences in stone tool assemblages may be related to different cultural activities (e.g. primary reduction vs maintenance flaking). Results from the test excavation program indicate that the sites may display assemblages with different characteristics, possibly representing different activities or site use over a prolonged time or repeated occasions. The science of archaeology is paramount to any research question and it is important to stress that the goal for the salvage program for all excavated sites is straight forward: to retrieve a viable sample for comparative analysis using established techniques (see Field Methods below). In this regard interpretation would not precede data collection. The proposed archaeological program would systematically sample the relevant areas using standard techniques with the outcome being a viable, robust and comparable sample. Analysis of the sample would follow and interpretations would be made distinctly separate from the results.

Question 1: What cultural activities are archaeologically identifiable in association with exploitation of estuarine environments?

Question 2: How does past Aboriginal use of this area relate to activities in adjacent areas (alluvial plains, ridgelines and the more elevated sandstone escarpments further west)?

Question 3: Do the sites display any unique or distinguishing traits that may be the result of their location in a unique landscape?

Question 4: Do sites contain evidence for repeated or specialised activities across long periods of time, or a single event in time? Is this reflected within the artefact assemblage (i.e. preference for certain raw material or artefact types)?

Archaeological Salvage Areas

Salvage excavation would be undertaken on identified archaeological sites DLS Boral AFT 1 and DLS Boral AFT 2. Salvage excavation of these sites would focus on the extraction of collections of artefacts related to activity areas and geomorphic information.

FIELD METHODS

The goal of the field excavation program is to recover significant assemblages of artefacts and investigation of contributing geomorphic processes.

Salvage Program

In order to achieve the most robust and comparable result, KNC advocates an open area salvage excavation. The first phase in open area salvage is to establish the statistical boundaries of the previously identified archaeological deposit. This approach is designed to salvage the spatial properties of the site as shown in the lithic continuum; in other words, recording the spread of activities across the site and wider landscape.

Phase 1

A series of 1 m² squares are excavated on a transect grid overlain on the site impact area to confirm the spread of lithics and related geomorphic activity. Phase 1 squares would be positioned to complement and augment the information from the previous test excavation programs conducted at the site.

Where Phase 1 test results identify information bearing deposit, Phase 2 excavation will be completed. Information bearing deposits are identified by triggers such as: significant quantities of artefacts, variations in raw material, unusual artefacts, chronological material and/or taphonomic indicators. In this context chronologic material is anything that can be used to date artefacts or deposit: charcoal or charcoal bearing deposit (e.g. hearth ash), sandy deposit, gravels (e.g. aluminium feldspar). Where necessary, additional Phase 1 squares can be excavated to confirm the spread of lithics and related geomorphic activity. Excavation intervals for additional Phase 1 squares would be determined by the findings of the salvage program and boundaries of the proposed impact area. It is anticipated that up to 25 additional Phase 1 squares would be required at each of the salvaged sites.

Phase 1 excavation would also determine the depth of intact archaeological material to ensure the retrieved sample is representative of cultural activity. Geoarchaeological assessment will use 50mm micro cores to assist the determination of the depth of archaeological material.

Phase 2

Open area salvage, Phase 2 will expand on Phase 1 squares to encompass entire activity areas. It is anticipated that around 75-100m² will be excavated during the Phase 2 salvage program. Additional excavation beyond this estimated total may be required depending on the progression of the salvage program and potential requirement to capture more archaeological data i.e. expansion of open areas beyond initial estimates in order to capture entire activity areas, or continuation of archaeological material in contexts suitable for radiometric dating. Up to 100m² of additional excavation may be required (total Phase 2 excavation limit of 200m²).

Individual excavation squares measuring 1 m² would be hand excavated in stratigraphic units (Unit A, Unit B, etc.). Squares would be excavated until the basal layer or culturally sterile deposit is reached (on average to 80 centimetres, potentially up to 1.5m below the surface). Excavation will be undertaken by stratigraphic unit. Excavation at depths beyond 1 metre may require stepping in order to facilitate access to potentially deep deposits.

Sieving of the excavated deposit is required with a minimum sieve mesh size of 2.5mm. The use of the 1mm sieve mesh will also be used to capture micro debitage (where required) for assessing depositional movement (possibly pumice debitage that could indicate natural reworking activity) and interpreting activity areas. The use of 1mm sieve mesh has been shown to contribute significant information about site integrity and artefact reduction.

Sampling of the sandy matrix to at least 1.5m depth will be undertaken in areas revealing high density or significant cultural deposits. In addition, thin section profiles (where feasible) would also be collected from open areas. The soil profiles of all areas would be fully documented and appropriate records would be archived.

Carbon samples will be collected and analysed for material relating to both the archaeology and geomorphology. Where appropriate cosmogenic and radiometric dating of soils and rock surfaces will be applied (Nishiizumi et al. 1986, 1993).

The location of each excavated square would be identified on a surveyed plan of the site. Stratigraphic sections detailing the stratigraphy and features within the excavated deposit would be drawn and all squares would be photographed.

Analysis

Artefacts would be analysed on a comparable level with previous analyses of excavated assemblages. Information derived from this analysis; in particular the identification of specific artefact types and their distributions and associations; would be used to put together interpretations about how sites were used, where sites were located across the landscape, the age of sites and to assess cultural heritage values. By comparing different areas it would be possible to determine whether there were differences in the kinds of activities carried out and if different activities were related to different landforms.

The geoarchaeological assessment will focus on the integrity of the deposit and the ramifications of geomorphic change for: artefact survivability, interspatial assessments and scientific significance.

A range of stone artefacts may be present across the salvage areas and the analysis would expand accordingly to account for artefact variability. All information would be recorded in database form (MS Excel). Various types of evidence would be used to determine the kinds of activities that were carried out. A short description of the proposed analysis is outlined below.

- ◆ Field analysis would record basic data, such as material type, number and any significant technological characteristics, such as backing or bipolar techniques; added to this would be any provenance data such as pit ID and spit number. The purpose of the field recording is twofold: 1) establish a basic recording of artefacts retrieved and 2) to allow on-going assessment of the excavation regime (e.g. whether higher stratigraphic resolution is required while digging).
- ◆ Detailed (laboratory) analysis would entail recording a larger number of characteristics for each individual artefact. These details would be recorded in matrices suitable for comparative analysis (e.g. multivariate and univariate) of the excavated assemblage on a local and regional basis.
- ◆ Lithic characteristics to be recorded cover a range of basic information but are not limited to these categories (see example below). For transparency, terms and category types would in large part be derived from Holdaway and Stern (2004).

Sample Categories		
Record Number	% Cortex	Flake Type
Pit ID	Length	Termination Type
Spit Number	Width	Core Type
Count	Thickness	Number of Scars (Core)
Raw Material	Weight	Scar Type (Core)
Colour	Modification	Shape of Flake
Quality	Reduction Type	Platform Type

- ◆ A detailed explanation and glossary would be provided with the final excavation report.
- ◆ Minimum Number of Flake (MNF) calculations formulated by Hiscock (2002) would be undertaken where applicable (although past experience indicates MNF calculations would not be required for this excavation program).

The analysis of artefacts recovered during the excavation program would be undertaken in a transparent and replicable fashion so as to permit the comparison of the entire excavated assemblage with data from other areas. This would also allow for an interpretation of the study area's archaeological significance.

Field Team

KNC directors, Dr Matthew Kelleher and Alison Nightingale, would be responsible for the salvage excavation program. Dr Matthew Kelleher would direct the excavation component of the Aboriginal archaeological assessment. Matthew has extensive experience in managing archaeological excavations and research projects. Matthew would also be the principal contact for the overall Aboriginal archaeological assessment for the project. The salvage excavation will be undertaken in partnership with registered Aboriginal stakeholders.

Appendix F – Test Square Section Descriptions

Stage 5A Test Excavation Area (DLS Boral AFT 2 & DLS Boral AFT 3)

	<p>VI. 0-25cm: Dark grey-brown loam, humic. Abundant rock inclusions to <15cm 20% including road base, bricks, sandstone and ironstone. Scattered lumps of clay. Diffuse boundary to:</p> <p>VII. 25cm-35cm: Dark orange brown clayey loam. Mixed lumps of clay, ironstone pieces and scattered rocks and gravel.</p> <p>VIII. At 35cm: Orange and grey clay clumps, mixed with rocks and gravels – overlying tidal flat.</p>
	<p>I. 0-20cm: Disturbed – dark grey silty mixed fill, road base, gravels, brick fragments, sandstone, metal and other mixed rubbish</p> <p>II. Base: Undulating red-orange clay and mixed rocks (disturbed fill) – overlying tidal flat</p>
	<p>I. 0-28cm: Disturbed – mixed fill, clay, rocks, imported rubble as per TS1 and TS2 – overlying tidal flat</p>

TS1 north section (DLS Boral AFT 3)

TS2 north section (DLS Boral AFT 3)

TS3 south section (DLS Boral AFT 3)



TS4 south section (DLS Boral AFT 2)

- I. 0-17cm: Disturbed – mixed fill layer, gravel, clay
- II. 17-45cm: Natural – grey sand, dry, pH5.5
- III. 45-88cm: Pale brown sand, slightly moist, pH5.5, gradual boundary to tidal flat transition
- IV. Orangy brown sand, moist, pH 6
- V. Base: As per IV



TS5 south section (DLS Boral AFT 2)

- I. 0-10cm: Sandy grey topsoil, soft, abundant grass roots
- II. 10-28cm: Colour change to paler grey sand, small concentrations of charcoal
- III. 28-50cm: Soft, sand, light grey to a pale, bleached colour – barrier sand
- IV. 50-100cm: Soft yellow sand, pinkish tinge when dry, charcoal flecking – barrier sand
- V. Base: Orangy brown sand – mud flats



TS6A west section (DLS Boral AFT 2)

- I. 0-8cm: Medium grey sand, humic layer. Dense fine root systems throughout. Diffuse boundary to:
- II. 8-35cm: Medium grey sand. Diffuse boundary to:
- III. 35-70cm: Light greyish brown fine barrier sand. Charcoal fragments with patches of staining. Diffuse boundary to:
- IV. 70-120cm: Rich orange brown sand with very few roots, mottled with a paler brown sand throughout – tidal flat transition
- V. Base: As per IV.



TS6B east section (DLS Boral AFT 2)

- I. 0-8cm: Medium grey sand, humic layer. Frequent fine root systems throughout. Diffuse boundary to:
- II. 8-36cm: Medium grey sand. Charcoal fragments between 30 and 36cm. Diffuse boundary to:
- III. 36-63cm: Light greyish brown fine barrier sand. Larger charcoal fragments between 45 and 60 cm mainly within the southern section. Diffuse boundary to:
- IV. 63-78cm: Light orangy brown barrier sand. Some mottled light brown sand mottled. Diffuse boundary to:
- V. 78cm-base: Orangy brown sand, moist. Continuing to the base
- VI. Base: Orangy brown estuarine sand.

 <p>TS7 south section (DLS Boral AFT 2)</p>	<ul style="list-style-type: none"> I. 0-3cm: Recent humic topsoil in weak grey sand, very fine II. 3-25cm: Medium grey sand, faint biopores, gradual boundary to: III. 25-60cm: Pinkish pale grey barrier fine sand, scattered gravels and pebbles <30mm, gradual boundary to: IV. 60-100cm: Orange brown sand, slightly coarser grain size, increasingly dark with depth, transitional tidal sand, pale linear sand feature in base
 <p>TS8 west section (DLS Boral AFT 2)</p>	<ul style="list-style-type: none"> I. 0-25cm: Medium grey slightly humic fine sand, bioturbated boundary to: II. 25-60cm: Paler grey barrier sand, faint biopores filled with I, diffuse transition to: III. 60-100cm: Orange sand, becoming orange-brown tidal sand with depth. IV. Base: Orange-brown sand.
 <p>TS9 east section (DLS Boral AFT 2)</p>	<ul style="list-style-type: none"> I. 0-8cm: Humic grey sand II. 8-34cm: Grey sand, dry, coarse barrier sand III. 34-57cm: Light greyish brown moist barrier sand, coarse IV. 57-86cm: Light brown sand V. 86-100cm: Reddish brown tidal sand, moist, darker in colour than IV.



TS10 north section (DLS Boral AFT 2)

- I. 0-9cm: Sandy topsoil, loose, grey-brown, abundance of grass roots, diffuse boundary to:
- II. 9-32cm: Change in colour to a pinkish brown, charcoal frequent (up to 20%)
- III. 32-45cm: Burnt root channel, abundant charcoal
- IV. 45-base: Orange-yellowish sand.
- V. Disturbance – plastic pipe present in base of the square



TS11 north section (DLS Boral AFT 2)

- I. 0-25cm: Disturbed – medium brown sand press mixed with broken glass, ceramic shards and blue metal. Dense grass roots to 8cm. Well defined boundary to:
- II. 25-60cm: Medium grey barrier sand with small patches of orange brown sand within root cavities. Diffuse boundary to:
- III. 60-100cm: Orange-brown sand with occasional patches of pale beige sand
- IV. Base: Orange brown tidal sand.



TS12 west section (DLS Boral AFT 2)

- I. 0-5cm: Shallow fill deposit
- II. 5-23cm: Grey sand, dry, charcoal flecking scattered throughout
- III. 23-50cm: Light greyish brown barrier sand, small charcoal flecks scattered
- IV. 50-85cm: Brown sand
- V. 85-100cm: Slightly darker colouration, orangy brown transitional sand
- VI. Base: Orange brown tidal sand.



TS13 west section (DLS Boral AFT 2)

- I. 0-17cm: Disturbed – brown sandy clay fill with blue metal, glass, other rubble inclusions, clear boundary to:
- II. 17-57cm: Medium grey barrier sand with charcoal lenses and scattered charcoal flecking, diffuse boundary to:
- III. 57-100cm: Pale yellow-beige sand with occasional charcoal fragments (2-8mm). Artefact recorded in situ at 65cm depth.
- IV. Base: Pale beige transitional sand

	<ol style="list-style-type: none"> I. 0-15cm: Disturbed – fill, mixed brown clay and sand with fragments of stone and other rubble II. 15-39cm: Natural – medium grey sand with charcoal fragments (2-12mm). Diffuse, mottled boundary to: III. 39-90cm: Pale beige barrier sand with occasional rootlet IV. Base: Pale beige transitional sand
<p>TS14 west section (DLS Boral AFT 2)</p> 	<ol style="list-style-type: none"> I. 0-9cm: Dark grey sand, humic layer. Frequent fine root systems throughout. Diffuse boundary to: II. 9-30cm: Dark grey, almost black sand, moist. Ironstone and gravel inclusions, approximately 10%. Possible acid sulphate contamination due to the strong odour. Clear boundary to: III. 30-48cm: Brown grey mud flat sand, moist. Diffuse boundary to: IV. 48cm-base: Light brown tidal sand, high moisture content. Clear boundary to: V. Base: Light brown sand. Water table encountered.
<p>TS15 north section (DLS Boral AFT 2)</p> 	<ol style="list-style-type: none"> I. 0-7cm: Dark grey sand, humic, frequent fine roots. Diffuse boundary to: II. 7-30cm: Dark grey, almost black mud flat sand, very moist. Frequent ironstone and gravels, moderately compact. Strong odour. III. 30-70cm: Brown-grey tidal sand, wet, heavy, occasional gravels, becoming paler with depth IV. 70cm (base): Water table reached.

Stage 5B Test Excavation Area (DLS Boral AFT 1)





TS1A west section (DLS Boral AFT 1)



- I. 0-12cm: Pale grey sand, humic. Frequent fine root systems.
- II. 12-31cm: Pale grey barrier sand. Infrequent charcoal fragments inclusions. Diffuse boundary to:
- III. 31-58cm: Pale brownish grey sand. Small latite gravel and large colluvial latite cobbles from 50-58cm. Some charcoal flecks scattered. Diffuse boundary to:
- IV. 58-70cm: Dark brownish red sand becoming dark orange brown towards the base. Increasing moisture
- V. Base: Dark orange brown transitional sand.








TS1B east section (DLS Boral AFT 1)




- I. 0-12cm: Pale grey sand, humic. Frequent fine root systems.
- II. 12-31cm: Pale grey – grey-brown barrier sand. Infrequent charcoal fragments inclusions. Diffuse boundary to:
- III. 31-58cm: Pale brownish grey sand. Small latite gravel and large colluvial latite cobbles from 50-58cm, lesser frequency than in adjoining pit 1A. Some charcoal flecks scattered. Diffuse boundary to:
- IV. 58-70cm: Dark brownish red sand becoming dark orange brown towards the base. Increasing moisture
- V. Base: Dark orange brown transitional sand .

 <p>TS2 A & B south sections (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-2cm: Pale grey sand, humic. Frequent fine root systems. II. 2-50cm: Soft, pale grey barrier sand, charcoal flecking, occasional grass roots III. 50-80cm: Increase in moisture content, colouration change to a darker grey. Large (7-9cm diameter) tree root. IV. 80-100cm: Dark brownish red transitional sand becoming dark orange-brown towards base V. Base: Dark orange brown sand
 <p>TS3 west section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-5cm: Humic, grass and grass roots, sand II. 5-30cm: Grey barrier sand, dry, some charcoal flecks, scattered III. 30-57cm: Light brown moist sand IV. 57-60cm: Dark reddish brown sand, moist V. Base: Dark reddish brown transitional sand

 <p>TS4 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-8cm: Grass and roots in weak pale grey sand II. 8-50cm: Pale grey barrier sand continues, sparse roots, scattered charcoal <1cm III. 50-58cm: Layer of red-brown sand, boundaries appear bioturbated IV. 58-65cm: Layer of grey sand as per II V. 65-70cm: Dark red-brown sand VI. Base: Dark red-brown transitional sand
 <p>TS5 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-15cm: Pale grey very weak sand, grass and roots II. 15-50cm: Medium grey barrier sand (moist) drying to pale grey. pH 6. Scattered charcoal <1cm, no other inclusions. Diffuse boundary to: III. 50-60cm: Dark red-brown sand, very weak IV. Base: Dark red-brown transitional sand. pH 6.5.

	<ol style="list-style-type: none"> I. 0-2cm: Thin topsoil, humic, sandy II. 2-28cm: Disturbed – mixed fills of sandy loam, dark grey, flecks of charcoal and frequent gravels, historical ceramic fragments and broken glass from 10-30cm. III. 28-50cm: Sandy, soft, pale barrier sand, occasional small grass roots IV. 50-60cm: Colour change to light gold/orange V. Base: Orange transitional sand
	<ol style="list-style-type: none"> I. 0-8cm: Grass and roots in weak pale grey sand II. 8-35cm: Grey barrier sand continues, no inclusions, diffuse boundary to: III. 35-60cm: Orange brown weak transitional sand IV. Base: Orange brown sand as per III.
	<ol style="list-style-type: none"> I. 0-4cm: Topsoil, thin, humic II. 4-20cm: Sandy, soft, dark grey, tiny grass roots, flecks of charcoal III. 20-35cm: Change in colour (possibly bleached) to a barrier pale, light grey. Very soft/weak IV. 35-50cm: Sandy, soft, yellow in colour (moist) with pink tinge after drying V. 50-80cm: As per IV but wet, yellow in colour VI. Base: Transitional yellow sand

 <p>TS9A north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-18cm: Loose, medium grey sand with thin grass roots throughout. Horizon boundary generally level and clearly defined II. 18-48cm: Medium brown barrier sand, some mottling with darker grey patches surrounding charcoal, charcoal fragments 8-19mm appearing at 18cm depth and again at 28cm depth. Significant quantity of charcoal at 30cm which has stained surrounding sand to dark grey III. 48-100cm: Orange-brown sand with occasional charcoal fragments, red chroma and hue increasing with depth IV. Base: Orange brown transitional sand
 <p>TS9C south section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-20cm: Loose medium grey sand with thin roots, more common in upper 10cm. Scattered charcoal at 18cm depth as per adjoining pit 9A. Well-defined and level boundary to: II. 20-48cm: Orangy brown transitional (slightly grey) sand with some charcoal fragments at 28cm as per pit 9A in a shallow (c.2cm) deposit. Fragments were small and dispersed. This feature was excavated and sieved separately. III. 48-100cm: Orangy brown sand with some small charcoal fragments and some thin roots IV. Base: Orangy brown estuarine sand with very few thin roots

 <p>TS10A west section at 80cm (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-12cm: Reddish grey weak sand, humic, organic. Frequent fine root systems throughout. Diffuse boundary to: II. 12-47cm: Grey sand mottled with some pale orange transitional sand. Bioturbated. Charcoal flecks and fragments scattered from 44 to 49cm. Diffuse boundary to: III. 47cm-base: Orange brown sand. Becoming slightly darker towards the base. IV. Base: Dark orange estuarine brown sand.
 <p>TS10C south section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-12cm: Reddish grey weak sand, humic, organic. Frequent fine root systems throughout. Diffuse boundary to: II. 12-47cm: Grey transitional sand mottled with some pale orange sand. Bioturbated. Charcoal flecks and fragments scattered from 44 to 49cm. Diffuse boundary to: III. 47cm-base: Orange brown sand. Becoming slightly darker towards the base. IV. Base: Dark orange brown estuarine sand.
 <p>TS11 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-9cm: Topsoil, soft grey brown loam, tiny grass roots II. 9-18cm: Sandy, soft, occasional small gravels, grass roots III. 18-30cm: Sandy, soft, dark grey, charcoal flecking IV. 30-50cm: Soft yellowish tidal sand (moist) drying to a pinkish yellow V. Base: As per IV.

 <p>TS12 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. Undulating ground. Surface sloping to east. 0-10cm: Sandy loam topsoil, humic, grass and grass roots II. 10-20cm: Soft grey, sandy, occasional charcoal flecking. Occasional modern rubbish (glass and ceramics) throughout. III. 20-30cm: Darker grey, soft, transitional sand, occasional small gravels and charcoal flecking. Occasional modern rubbish (glass and ceramics) throughout. IV. 30-50cm: Light brown estuarine sand, soft V. Base: Light brown sand, soft
 <p>TS13 south section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. Large rock on surface extending north beyond square. 0-32cm: Disturbed – mixed fill including rocks and cobbles, timber fragments in very dark brown mixed sandy loam fill, loose, abrupt boundary to: II. 32-70cm: Transitional sand, soft, yellow in colour, occasional small gravels and charcoal flecking, small grass roots III. Base: Sandy, soft, yellow in colour
 <p>TS14 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. Undulating ground. Surface sloping to east 0-8cm: Sandy loam topsoil, grey, grass roots., gravels II. 8-20cm: Sandy, soft, dark grey, some charcoal and gravels III. 20-50cm: Yellowish transitional sand, soft, charcoal flecking, minor shell fragments IV. Sandy, soft, yellow in colour



TS15 south section (DLS Boral AFT 1)

- I. 0-22cm: Medium brown sand, humic, thin grass roots, abundant in upper 9cm
- II. 22-29cm: Band of darker grey barrier sand, charcoal fragments throughout, thick tree root at this depth running east-west across square. Clear boundary to:
- III. 29-64cm: Orange brown transitional sand with occasional charcoal fragment
- IV. Base: Orange brown sand



TS16 north section (DLS Boral AFT 1)

- I. 0-13cm: Topsoil, loose, sandy, light grey, grass roots
- II. 13-25cm: Bleached barrier sand, white and grey, charcoal flecking and occasional small gravels
- III. 25-80cm: Barrier sand, moderately compact, yellow in colour, occasional charcoal
- IV. Base: Yellow transitional sand, moderately compact



TS17 south section (DLS Boral AFT 1)

- I. 0-10cm: Medium brown sand, thin grass roots, diffuse boundary to:
- II. 10-16cm: Medium grey barrier sand with charcoal fragments (2-4mm, 5%)
- III. 16-40cm: Medium brown sand with occasional charcoal and thin roots
- IV. 40-80cm: Orangy-brown transitional sand. Artefacts found in situ at 61cm depth.
- V. Base: As per IV with patches of paler sand in two locations. One patch of hardened sand with iron staining.



TS18 north section (DLS Boral AFT 1)

- I. 0-14cm: Medium brown sand with grass roots, well defined boundary to
- II. 14-25cm: Medium grey barrier sand with charcoal fragments (5%) and occasional thicker roots. Mottled, diffuse boundary to:
- III. 25-43cm: Grey brown sand with less charcoal than II. Even, clear boundary to:
- IV. 43-80cm: Orangy brown sand
- V. Base: Orange brown transitional sand with small patch of lighter yellow.






TS19 south section (DLS Boral AFT 1)

- I. 0-16cm: Light yellow sand, humic
- II. 16-44cm: Light grey barrier sand
- III. 44-57cm: Dark grey mix disturbed barrier sand
- IV. 57-80cm: Orangy brown sand
- V. 80-93cm: Darker orange brown transitional sand



TS20 north section (DLS Boral AFT 1)

- I. 0-16cm: Light brown sand
- II. 16-32cm: Light grey barrier sand
- III. 32-67cm: Light yellow sand, brownish
- IV. 63-80cm: Mottled yellow and grey sand
- V. Base: Orangy transitional sand

 <p>TS21 north section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-10cm: Light grey loamy sand, humic. Frequent fine root systems throughout. Diffuse boundary to: II. 10-25cm: Light grey barrier sand. Charcoal flecks scattered. Some roots inclusions. Clear boundary to: III. 25-35cm: Light pinkish grey soft barrier sand. Some occasional flecks scattered. Diffuse boundary to: IV. 35-base: Yellowish brown sand, moist. V. Base: Yellowish brown transitional sand.
 <p>TS22 west section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-7cm: Topsoil, humic, grass roots II. 7-20cm: Dark grey barrier sandy loam, mixed with gravels and roots and some charcoal III. 20-90cm: Yellow-gold transitional sands, moderately compact, flecks of charcoal. Fragmented shell between 30-60cm. IV. Base: Yellowish-gold sand
 <p>TS23 east section (DLS Boral AFT 1)</p>	<ul style="list-style-type: none"> I. 0-29cm: Slightly brownish grey sand, thin grass roots. Gradual boundary to: II. 29-47cm: Dark grey-brown barrier sand, occasional charcoal fragments (4-10mm), some larger gravels and small cobbles, mottled boundary to: III. 47-85cm: Yellow brown barrier sand IV. 85-100cm: Orangy brown transitional sand with some areas of paler sand in base



TS24 north section (DLS Boral AFT 1)

- I. 0-30cm: Weak medium grey barrier sand, few inclusions, grass roots frequent in top 8cm, gradual boundary to:
- II. 30-60cm: Decreasing humic material, paler grey barrier sand becoming pinkish with depth
- III. 60-70cm: Becoming reddish brown transitional sand, weak structure. Faint biopores at 70cm